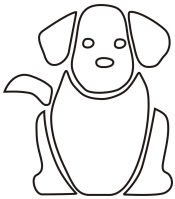
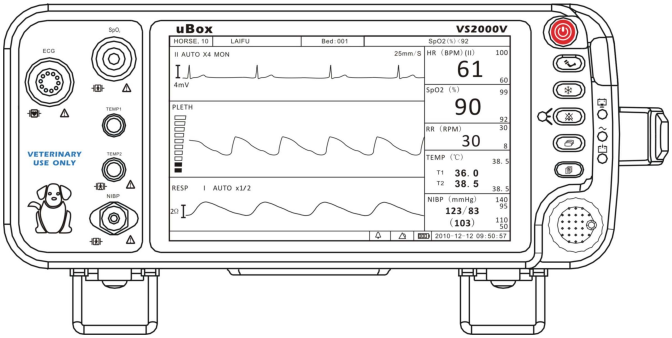


VS2000V
Veterinary Vital Signs Monitor
Operation Manual



— English

Version 1.0, March 2011

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Warranty and Service Information

Proprietary Notice

Information contained in this document is copyrighted by Utech Co., Ltd. and may not be duplicated in full or part by any person without prior written approval of UTECH Co., Ltd. Its purpose is to provide the user with adequately detailed documentation to efficiently install, operate, maintain and order spare parts for the device supplied. All information contained in this document is believed to be current and accurate as of the date of publication or revision, but does not constitute a warranty.

Limited Warranty

Utech Co., Ltd. ("Seller") warrants to the original purchaser that the Product, not including applicable accessories, shall be free from defects in material and workmanship under normal use, if used in accordance with its labeling, for **one year** from the date of shipment to the original purchaser.

Seller warrants to the original purchaser that the reusable oximeter sensors supplied as accessories, shall be free from defects in materials and workmanship under normal use, if used in accordance with its labeling, for one year from the date of shipment to the original purchaser.

Seller warrants to the original purchaser that the reusable ECG leads and reusable NIBP purple hose supplied as accessories, shall be free from defects in materials and workmanship under normal use, if used in accordance with its labeling, for 90 days from the date of shipment to the original purchaser.

Blood pressure cuffs carry a (6) six month warranty, pending evaluation by Utech Co., Ltd. (UTECH) Technical Services. Cuffs that are contaminated, have liquid in them, have been misused/ abused or are older than (6) months will not be covered under warranty. The sole obligation of UTECH under this warranty will be to repair or replace, at its option, products that prove to be defective during the warranty period.

The foregoing shall be the sole warranty remedy. Except as set forth herein, seller makes no warranties, either expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. No warranty is provided if the products are modified without the express written

consent of Utech Co., Ltd. and seller shall not be liable in any event for incidental or consequential damage. This warranty is not assignable.

Warranties are subject to change. Please contact Utech Co., Ltd. for current warranty information.

Disclaimer of Warranties

THE FOREGOING EXPRESS WARRANTY, AS CONDITIONED AND LIMITED, IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Seller disclaims responsibility for the suitability of the Product for any particular medical treatment or for any medical complications resulting from the use of the Product. This disclaimer is dictated by the many elements which are beyond Seller's control, such as diagnosis or patient, conditions under which the Product may be used, handling of the Product after it leaves Seller's possession, execution of recommended instructions for use and others.

Conditions of Warranty

This warranty is void of the Product has been altered, misused, damaged by neglect or accident, not properly maintained or recharged, or repaired by persons not authorized by Seller. Misuse includes, but is not limited to, use not in compliance with the labeling or use with accessories not manufactured by Seller. This warranty does not cover normal wear and tear and maintenance items.

Limitation of Remedies

The original purchaser's exclusive remedy shall be, at Seller's sole option, the repair or replacement of the Product. **THIS IS THE EXCLUSIVE REMEDY. In no event will Seller's liability arising out of any cause whatsoever (whether such cause is based in contract, negligence, strict liability, tort or otherwise) exceed the price of the Product and in no event shall Seller be responsible for consequential, incidental, or special damages of any kind or nature whatsoever, including by not limited to, lost business, revenues and profits.**

Service Support

Repairs for devices manufactured by UTECH company under warranty must be made at authorized repair centers. If the device needs repair, contact your local distributor or the UTECH company after-service department. When calling, have the device's model and serial number ready.

If you need to ship the device, pack the device and accessories carefully to prevent shipping damage. All accessories should accompany the device.

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Zhangjiawan, Shapingba District,
Chongqing, China

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E-mail service@chinautech.com
Web site www.chinautech.com

NOTE! Shipments received without a return number will be returned to sender.

Keep all original packing material, including any inserts. If you need to ship the device, use only the original packaging material, including inserts. Box and inserts should be in original condition. If original shipping material in good condition is not available, it should be purchased from Utech Co., Ltd.

Damages occurring in transit in other than original shipping containers are the responsibility of the shipper. All costs incurred returning devices for repair are the responsibility of the shipper.

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Chapter 1: Introduction

1.1 About this Manual

The Operation Manual provides installation, operation, and maintenance instructions for health-care professionals and other users, trained in monitoring respiratory and cardiovascular activity.

These instructions contain important information for the safe use of the product. Read the entire contents of these Instructions For Use, including Warnings and Cautions, before using the monitor. Failure to properly follow warnings, cautions and instructions could result in death or serious injury to the patient.

1.2 Using the Manual

The monitor allows you to choose the measurement capabilities you need. A measured value refers to a derived or calculated value; a parameter refers to one or more specific measured values. For example, pulse rate and %SpO_2 are measurements; the oximeter parameter consists of both these measured values. Operation of the monitor is the same regardless of the number of parameters you use.

If you are not familiar with the operation of this monitor, follow each chapter in the manual in order. Each chapter builds on the information from the previous chapter. If the monitor is already set up, or if you are familiar with its operation, turn to the chapter that describes the features you will use.

1.3 Definition of Symbols

SYMBOLS	DEFINITION
	Attention, see in instructions for use
	Type BF Defibrillation
	Defibrillator-proof type CF equipment
	NIBP Start/ Stop Key
	Freeze Key
	Alarm Silence
	Battery Supply LED

~	AC Power LED
	Battery Charge LED
	Date of Manufacturing
IPX1	Drip Proof (monitor only)
	Indicates separate collection for electrical and electronic equipment.

1.4 Warning Information

KEYWORD	DEFINITION
WARNING	Tells you something that could hurt the patient or hurt the operator.
CAUTION	Tells you something that could damage the device.
NOTE	Tells you other important information.

General Warning, Cautions, and Notes

WARNING! Do not use this device in the presence of flammable anesthetics or other flammable substance in combination with air, oxygen-enriched environments, or nitrous oxide.

WARNING! ELECTRICAL SHOCK HAZARD when cover is removed. Do not remove covers. Refer servicing to qualified personnel.

WARNING! Do not use this device in the presence of magnetic resonance imaging (MR or MRI) equipment.

WARNING! Do not plug the monitor into an outlet controlled by a wall switch.

WARNING! This device is intended for use by persons trained in professional health care. The operator must be thoroughly familiar with the information in this manual before using the device.

WARNING! Do not autoclave, ethylene oxide sterilize, or immerse the monitor and other accessories in liquid. Evidence that liquid has been allowed to enter the monitor voids the warranty.

WARNING! This device must be used in conjunction with clinical signs and symptoms. This device is only intended to be an adjunct in

patient assessment.

WARNING! Equipment is protected against defibrillator discharge. Rate meters and displays may be temporarily affected during defibrillation, but will rapidly recover.

WARNING! The vital sings monitor is suitable for use within the patient environment IEC 60950 approved equipment must be placed outside of the patient environment. The patient environment is defined as any volume in which intentional or unintentional contact can occur between the patient and parte of systems or between the patient and other persons touching parts of the system.

WARNING! When connecting this monitor to any instrument, verify proper operation before clinical use. Use only equipment meeting specifications given in this manual. Refer to the instrument's user manual for full instructions. Accessory equipment connected to the monitor's data interface must be certified according to the respective IED standards, i.e. IEC 60950 for data processing equipment or IEC 60601-1 for electro medical equipment. All combinations of equipment must be in compliance with IEC 60601-1-1 systems requirements. Anyone connecting additional equipment to the signal input port or signal output port configures a medical system, and therefore, is responsible that the system complies with the requirements of the system standard IEC 60601-1-1.

WARNING! Any monitor that has been dropped or damaged should be checked by qualified service personnel to ensure proper operation prior to use.

WARNING! Use only original manufacturer or recommended patient cables. Use of accessories other than those specified may result in increased electro-magnetic (EM) emissions or decreased EM immunity of the device. To avoid potential electro-static discharge interference, do not use cables that incorporate metal or metal-coated connectors.

WARNING! Medical electrical equipment, including this device, needs special precautions regarding electro-magnetic compatibility (EMC) and needs to be installed and put into service according

to the EMC information provided in this manual.

WARNING! There is no defibrillator synchronization output on the monitor. Make no connections between the monitor and a defibrillator.

WARNING! This monitor will not operate effectively on patients who are experiencing convulsions or tremors.

WARNING! This monitor is not for home use.

WARNING! The monitor should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the monitor should be observed to verify normal operation in the configuration in which it will be used.

WARNING! This monitor is not for apnea detection. The monitor has not been tested or validated for use in apnea detection.

WARNING! Verify proper operating mode before attaching patient. See Select the Patient Type in Chapter of Setting Up the Monitor.

WARNING! Default alarm limits are provided for convenience. Verify that alarm limits are appropriate for given patient and condition, and adjust according to institutional policy.

WARNING! Ensure the monitor's AC rating is correct for the AC voltage at your installation site before using the monitor. The monitor's AC rating is shown on the rear panel rating plate. If the rating is not correct, do not use the monitor.

WARNING! Disconnect the AC power supply from the outlet before disconnecting it from the monitor. Leaving the AC power supply connected to an AC power outlet without being connected to the monitor may result in a safety hazard.

WARNING! Do not allow any moisture to touch the AC power supply connectors or a safety hazard may result. Ensure that hands are thoroughly dry before handling the AC power supply.

WARNING! Do not place the monitor in the patient's bed. Do not place the monitor on the floor.

WARNING! Failure to place the monitor away from the patient may allow the patient to turn off, reset, or damage the monitor, possibly resulting in the patient not being monitored. Make sure the patient cannot reach the monitor from their bed.

WARNING! If there is a risk of the AC power supply becoming disconnected from the monitor during use, secure the cord to the monitor several inches from the connection.

WARNING! This device is intended for use by trained healthcare professionals. The operator must be thoroughly familiar with the information in this manual before using the device.

WARNING! Do not disassemble the unit. The unit is not use serviceable. Refer to qualified service personnel.

WARNING! It is the operator's responsibility to set alarm limits appropriately for each individual patient.

WARNING! If the accuracy of any measurement is in question, check the patient's vital sign(s) by an alternative method and then check the monitor for proper functioning.

WARNING! Operation of this device may be affected in the presence of strong portable and mobile communications equipment.

WARNING! Operation of this device may be adversely affected in the presence of computed tomography (CT) equipment.

CAUTION! Do not allow water or any other liquid to be spilled onto the monitor. Unplug the AC power cord from the monitor before cleaning or disinfecting the monitor.

CAUTION! This unit contains a lithium coin battery and a rechargeable alkaline battery. These batteries are not user replaceable. Refer servicing to qualified personnel.

CAUTION! Pressing front panel keys with sharp or pointed instruments may permanently damage the keypad. Press the front panel keys only with your finger.

CAUTION! Blocking the ventilation holes on the monitor's rear panel can

prevent air circulation inside the monitor, possibly resulting in damage to the monitor. Leave an air gap behind the monitor to allow air to circulate through the ventilation holes.

CAUTION! Chemicals used in some cleaning agents may cause brittleness of plastic parts. Follow cleaning instructions in this manual.

CAUTION! If the device becomes wet, wipe off all moisture and allow sufficient time for drying before operating.

CAUTION! Follow local governing ordinances and recycling instructions regarding disposal and recycling of device components and packaging.

NOTE! All user and patient accessible materials are non-toxic.

NOTE! Each input and output connection of the monitor is electrically isolated. Connection of this monitor to other equipment will not increase leakage current.

ECG Warnings, Cautions, and Notes

WARNING! Connect only three-lead or five-lead ECG lead wires from the patient to the ECG patient cable. Do not connect any other signal source to the ECG patient cable.

WARNING! This monitor does not identify or interpret arrhythmia events. The indication of heart rate may be adversely affected by the presence of cardiac arrhythmias.

WARNING! Line isolation monitor transients may resemble actual cardiac waveforms and thus inhibit heart rate alarms.

CAUTION! Only five-lead ECG cable can be used to this monitor. Using the incorrect cable for the selected mode might lead to a floating reference or additional noise on the ECG signal.

NOTE! Follow institutional standards when applying ECG electrodes. Silver/Silver Chloride disposable electrodes are strongly recommended to avoid polarization effects that result in large input offset potentials. Use of "squeeze bulb" type electrodes is not recommended.

NOTE! Use only standard five-lead ECG cable.

Oximetry Warnings, Cautions, and Notes

WARNING! Prolonged use or the patient's condition may require changing the sensor site periodically. Change the sensor site and check skin integrity, circulatory status, and correct alignment at least every 4 hours.

WARNING! When attaching sensors with micro foam tape, do not stretch the tape or attach the tape too tightly. Tape applied too tightly may cause inaccurate readings and blisters on the patient's skin (lack of skin respiration, not heat, causes the blisters).

WARNING! Using a damaged sensor may cause inaccurate readings, possibly resulting in patient injury or death. Inspect each sensor. If a sensor appears damaged, do not use it. Use another sensor or contact your authorized repair center for help.

WARNING! Using a damaged patient cable may cause inaccurate readings, possibly resulting in patient injury or death. Inspect the patient cable. If the patient cable appears damaged, do not use it. Contact your authorized repair center for help.

WARNING! Failure to carefully route the cable from the sensor to the monitor may allow the patient to become entangled in the cable, possibly resulting in patient strangulation. Route the cable in a way that will prevent the patient from becoming entangled in the cable. If necessary, use tape to secure the cable.

WARNING! If any of the integrity checks fail, do not attempt to monitor the patient. Use another sensor or patient cable, or contact the equipment dealer for help if necessary.

WARNING! Do not autoclave, ethylene oxide sterilize, or immerse the sensors in liquid. Evidence that liquid has been allowed to enter the monitor voids the warranty.

WARNING! Use only SpO_2 sensors supplied with, or specifically intended for use with, this device.

WARNING! SpO_2 measurements may be adversely affected in the presence of high ambient light. Shield the sensor area (with a surgical towel, for example) if necessary.

WARNING! Dyes introduced into the bloodstream, such as methylene blue, indocyanine green, indigo carmine, patent blue V (PBV), and fluorescein may adversely affect the accuracy of the SpO_2 reading.

WARNING! Any condition that restricts blood flow, such as use of a blood pressure cuff or extremes in systemic vascular resistance, may cause an inability to determine accurate SpO_2 and pulse rate readings.

WARNING! Under certain clinical conditions, pulse oximeters may display dashes if unable to display SpO_2 and/or pulse rate values. Under these conditions, pulse oximeters may also display erroneous values. These conditions include, but are not limited to: patient motion, low perfusion, cardiac arrhythmias, high or low pulse rates or a combination of the above conditions. Failure of the clinician to recognize the effects of these conditions on pulse oximeter readings may result in patient injury.

CAUTION! Unplug the sensor from the monitor before cleaning or disinfecting.

NOTE! Obstructions or dirt on the sensor's red light or detector may cause a sensor failure. Make sure there are no obstructions and the sensor is clean.

Non-invasive Blood Pressure Warnings, Cautions, and Notes

WARNING! Blood pressure measurements may be inaccurate if cuffs and/or hoses other than those specified by Utech Co., Ltd. are used.

WARNING! Repeated use of STAT mode for periods longer than 15 minutes should be avoided to reduce the patient's risk for soft tissue or nerve damage. When using the monitor for long periods of time, select the longest clinically appropriate measurement

interval and periodically examine the patient for signs of injury and ensure proper cuff placement.

WARNING! Make sure that hoses are not kinked, compressed, or restricted.

WARNING! Check that operation of the equipment does not impair the circulation of the monitored patient.

WARNING! Blood pressure measurements may not be accurate for patients experiencing arrhythmias.

WARNING! Do not verify the Non-Invasive Blood Pressure calibration while the cuff is attached to a patient.

WARNING! Verify cuff size is correct for the selected patient mode on the monitor.

CAUTION! To ensure that the unit remains in calibration, perform a calibration verification on a yearly basis.

CAUTION! Extremity and cuff motion should be minimized during blood pressure determinations.

CAUTION! Proper blood pressure cuff size and placement are essential to the accuracy of the blood pressure determination.

CAUTION! Any blood pressure recording can be affected by the position of the patient, his or her physiologic condition, and other factors.

CAUTION! Blood pressure measurements should be interpreted by a doctor.

NOTE! There are no user-serviceable adjustments for the Non-Invasive Blood Pressure calibration verification. If the monitor appears to be out of calibration, contact your authorized repair center for help.

NOTE! Systolic and diastolic blood pressure measurements determined with this device are equivalent to those obtained by the trained observer using the cuff/stethoscope auscultation method.

NOTE! Mean arterial blood pressure measurements determined with this

device are equivalent to those obtained by an intra-arterial blood pressure measurement device as determined by Utech Co., Ltd.

Respiration Rate Warnings, Cautions, and Notes

WARNING! Respiration monitoring is not recommended on active patients. It may lead to false alarm.

WARNING! Install white and red electrodes in opposite positions to obtain optimum respiration waveform. Avoid placing the cable above liver and ventricle to reduce false readings produced by the heart coverage or pulsation blood flow. This is very important for neonates.

Temperature Warnings, Cautions, and Notes

WARNING! Before monitoring starts, check if the sensor cable is properly connected. Pull the temperature sensor cable from the channel 1 jack, an error message "T1 sensor is off" is displayed on the screen and the alarm sound can be heard. The same happens with the other channel.

WARNING! Be cautious when handling temperature sensors and cables. When it is not in use, the sensor and cable ought to be in a loose loop. Tightly folded cable can cause mechanical damage.

WARNING! Temperature calibration should be done once a year (or according to the schedule specified in the hospital procedure). If calibration is needed, contact the manufacturer.

WARNING! Disposable temperature sensors should only be used once.

WARNING! During monitoring process, the temperature measurement instrument will conduct a self-check every hour lasting for two seconds. This will not affect normal operation of the monitor.

NOTE! Use only temperature sensors and interface cables specifically intended for use with this device.

Chapter 2: Intended Use and General Information

2.1 Intended Use

This vital signs monitor is intended to be used in special procedure labs and other areas of a veterinary hospital or clinic where veterinary monitoring systems are needed. The monitor package includes 5-lead electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2), Respiration Rate (RR) and temperature (TEMP).

The device permits patient monitoring with adjustable alarm limits as well as visible and audible alarm signals. The monitor provides fast, reliable measurement for patients ranging from cats to horses.

WARNING! The monitor was not designed or tested to be an apnea monitor.

WARNING! This monitor is not for home use.

2.2 Measurement Capabilities

Heart/Pulse Rate

Heart/pulse rate is measured with the ECG, oximetry, and non-invasive blood pressure (NIBP) parameters. The measured values can be continuously displayed in the ECG and SpO_2 parameter boxes. Heart/pulse rate can also be displayed in the NIBP HISTORY, found in the TRENDS menu. You can choose the source (AUTO, ECG, or SpO_2) of the heart/pulse rate displayed in the ECG parameter box. If you choose AUTO, the monitor will determine the best source depending on the quality of available data and selected source priority. See Choose the Heart Rate Source in the Chapter of ECG for detailed information regarding the source of the heart/pulse rate displayed in the ECG parameter box.

Electrocardiography (ECG)

The monitor provides continuous five-lead ECG processing, with standard lead selections, and filtering from electrocautery discharge. The ECG measured value (HR) and primary lead selection are displayed in the ECG parameter box, and an ECG waveform is continuously displayed.

Oximetry

The oximetry parameter provides the continuous non-invasive monitoring of oxygen saturation (%SpO_2) in the blood and pulse rate (PR). The measured values for oximetry (%SpO_2 and PR) and a pulse strength bar graph are displayed in the SpO_2 parameter box. A plethysmogram, or oxygen saturation waveform, can be continuously displayed. A variety of disposable and reusable sensors is available for monitoring patients.

Non-invasive Blood Pressure (NIBP)

The non-invasive blood pressure (NIBP) parameter provides systolic, diastolic, and mean arterial blood pressure values, and heart rate. The measured values for non-invasive blood pressure (SYS, DIA, and MAP) are displayed in the NIBP parameter box. NIBP measurements can be made in automatic, manual, or STAT modes.

Respiration Rate (RR)

The monitor provides respiration rate and Resp waveform by measuring the thoracic impedance between two ECG electrodes on the patient's chest. The measured RR is displayed in the RR parameter box. And the RR waveform is displayed on the RR waveform Channel.

Temperature (TEMP)

Two independent channels of temperature (T1 and T2) monitoring are available. Each channel is compatible with Utech Co., Ltd. YSI 400-series disposable temperature sensors, or equivalent. The measured value for each temperature channel (T1 and T2) is displayed in the TEMP parameter box.

Chapter 3: Controls and Features

3.1 Indicators and Displays with Embedded Submenus

The monitor has a high-resolution, high-contrast, color LCD display. It provides a continuous, real-time display of up to four waveforms. It also shows measured values, chronological data, measurement trends, alarm limits and patient information.

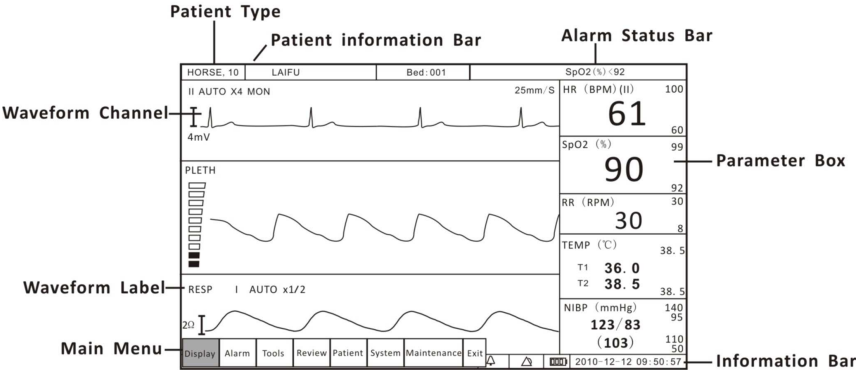


Figure 3.1: Display

DISPLAYS	DESCRIPTION
Patient Type	You must select the patient type (HORSE, DOG, or CAT) before monitoring a patient. When you change the patient type: •The alarm limits will be reset to their default settings.(if not in STATIC LIMITS mode) •NIBP inflation pressure settings will be reset for a cat, dog, or horse patient. •The NIBP mode will be reset to MANUAL.
Patient Information	Patient name and bed number will be shown here.
Alarm Status Bar	Shows active alarm events.
Main Menu	The main menu provides a means of changing monitor settings, such as alarm limits and patient information, and

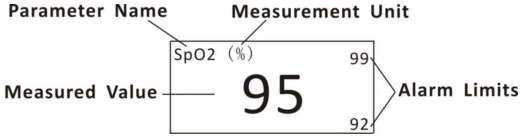
<table>
<tr><td></td><td colspan="2">performing monitoring functions. There are several points of entry into the monitor's menu system including the main menu, parameter menus, and waveform menus.</td></tr>
<tr><td>Waveform Channel</td><td colspan="2">Up to three waveform channels can be displayed simultaneously. Every channel can be assigned to a waveform from any enabled parameter, graph, table or blank. The waveform label provides access to a menu for each waveform where you can adjust various settings related to the waveform. For some parameters, such as ECG, the waveform label displays information about the primary lead and the size of the ECG tracing.</td></tr>
<tr><td>Waveform Label</td><td colspan="2">The waveform label shows the name of the waveform.</td></tr>
<tr><td>Information Bar</td><td colspan="2">Shows date and time, battery symbol and volume icon etc.</td></tr>
<tr><td rowspan="4">Parameter Box</td><td colspan="2"> 

Figure 3.2 Parameter Box</td></tr>
<tr><td colspan="2">The parameter box provides access to a menu for the parameter where you can adjust various settings related to the parameter.

The parameter box contains the parameter or measurement name, the numeric values for the selected measurement, the high and low alarm limits, and the measurement unit. In figure 3.2, the parameter is SpO_2, the numeric measured value is the pulse oxygen saturation (SpO_2), the alarm limits shown are for the pulse oxygen saturation (SpO_2), and the measurement unit is percent (%).</td></tr>
<tr><td>Parameter Name</td><td>The name of the monitored parameter is displayed.</td></tr>
<tr><td>Numeric Measured Values</td><td>The number value for the selected measurement (such as HR or SpO_2) is displayed. The value may be derived or calculated. Dashes (- - -) in place of a numeric measured value indicate that the measurement is invalid or unavailable.</td></tr>
</table>

	High and Low alarm limits	The high and low alarm limits for the numeric measured values are displayed. If you do not set alarm limits for a new patient, the default high and low limits will be used.
	Measurement Unit	Units of measurement can be changed for pressure. Pressure measurement units may be displayed as millimeters of mercury (mmHg) or kilopascals (kPa).

3.2 Keys

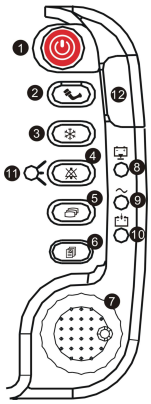


Figure 3.3: Keys

No.	DESRIPTION	INSTRUCTION
1	ON/OFF	Hold on this key for 3 seconds to turn on or turn off the monitor.
2	NIBP	Press this key to activate an immediate non-invasive blood pressure (NIBP) measurement. To cancel an NIBP measurement in progress, press the key again.
3	Freeze	Press this key to freeze the displayed waveform.
4	Alarm Silence	Press it in turn to silence the alarm volume for 30 sec, 60sec, 90sec, 120 sec or indefinitely.
5	Mode Key	Use this key to switch between the four main display modes: 1 ECG mode, 3 ECG mode, oxyCRG mode and the huge digit mode.
6	Menu Key	Press it to enter or exit the main menu.

7	Rotary Knob	The rotary knob is a dial control with a push selection switch. It is located on the front of the monitor, in the lower right corner. Turn the rotary knob to navigate the cursor around the display. Push the knob to select highlighted options.
8	Battery Supply LED	The green Battery Supply LED will light to indicate that the monitor is supplied by battery.
9	AC Power LED	The green AC Power LED will light to indicate that the monitor is connected to an AC power source.
10	Battery Charge LED	The green Battery Charge LED will light to indicate that the monitor is been charging.
11	Alarm Silence LED	The red Alarm Silence LED will flash to indicate that the alarm volume has been silence for 30 sec, 60sec, 90sec, 120 sec or indefinitely.
12	Work Status LED	Green when the monitor is working normal. Red when there is an alarm.

3.3 Left Panel

The left side panel of your monitor contains all of the patient connector receptacles.

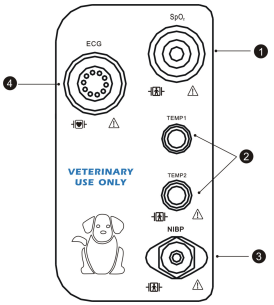


Figure 3.4: Left Panel

NO.	DESRIPTION	INSTRUCTION
1	Oximetry Connector (SpO_2)	Attach the SpO2 sensor to the monitor. Measured values for oxygen saturation (%SpO_2) in the blood and pulse rate (PR) will be displayed when the sensor is attached to the patient.
2	Dual Temperature	If the temperature is installed on your monitor, the TEMP parameter box will appear on the display when

	Connector (T1 up and T2 low)	the patient connector is attached to the monitor. A measured value for temperature (TEMP) will be displayed when the sensor is attached to the patient.
3	Non-Invasive Blood Pressure Connector (NIBP)	Attach the NIBP cuff to the monitor. Measured values for non-invasive blood pressure (systolic, diastolic, and mean) will be displayed when the most recent NIBP measurement is complete.
4	ECG Connector	Attach the ECG leads to the monitor. A measured value for the ECG heart rate (HR) will be displayed when the ECG leads are attached to the patient.

3.4 Back Panel

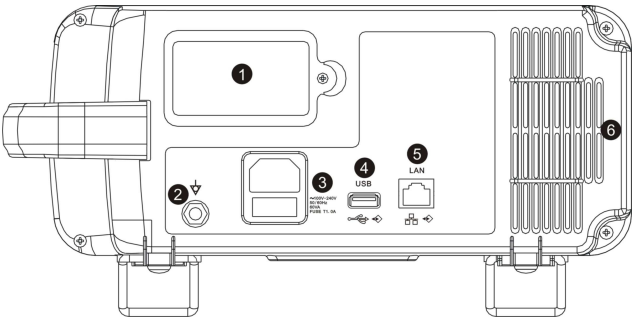


Figure 3.5: Back Panel

NO.	DESRIPTION	INSTRUCTION
1	Battery	The monitor is equipped with a lithium battery.
2	Equipotential Grounding	
3	AC Power Connector	Plug the AC power cord into the AC power receptacle at the back of the monitor. When the other end is plugged into a ground, three wire hospital-grade outlet, the AC Power LED will light. The monitor automatically switches between 100V and 240V AC line voltage sources. **WARNING! Do not plug the monitor into an outlet controlled by a wall switch.**
4	USB Connector	
5	Network Interface	Connect to the central monitor.
6	Air Vents	The monitor has air vents at the top of the back

		panel and on the bottom of the monitor.

3.5 Internal Battery

The installed internal rechargeable battery is intended primarily for backup and switch-over use. Charge the battery after the monitor has operated using battery power or after the monitor has been shipped or stored. To charge the battery, connect the AC power cord to the monitor and to the AC power source. There are no set up requirements for using a charged battery; the monitor operates exactly the same way under AC or battery power.

To replace the installed rechargeable battery:

1. Disconnect AC power and verify that the monitor is off.

2. Remove the battery door from the bottom of the monitor.

3. Disconnect the battery from the battery cable and remove it from the battery compartment.

4. Connect a new battery to the battery cable.

5. Insert the battery and cables into the battery compartment.

6. Reattach the battery door to the bottom of the monitor.

7. Connect the AC power cord to the monitor and to the AC power source and allow the battery to charge fully.

8. Dispose of the battery properly. See the CAUTION below.

CAUTION! The internal rechargeable battery is user-replaceable. It may contain a Lithium Ion (Li-ion), Nickel Metal Hydride (NiMH), or Sealed Lead Acid (SLA) battery. Disposal of such batteries should be conducted in accordance to local and federal guidelines.

NOTE! Typical battery life is 2 to 5 years depending on usage.

NOTE! When the monitor is connected to AC power, the internal battery charges whether the monitor is on or off. The Battery Charge LED flashes while the battery is charging; it is steady when the

battery is fully charged. Allow the battery to fully recharge before using the monitor under battery power.

NOTE! When approximately 15 minutes of battery use remains, the red battery icon is displayed in the information bar and a high priority alarm will occur.

NOTE! Battery charge time will be increased at elevated temperatures (temperatures above 30 degrees Celsius).

NOTE! A fully charged battery will last 2 to 3.5 hours, depending on monitor usage.

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Chapter 4: Setting up the Monitor

4.1 Unpacking the Monitor and Check the Shipment

1. Carefully remove the monitor and its accessories from the shipping carton. Save the packing materials in case the monitor must be shipped or stored.

2. Compare the packing list with the supplies and equipment you received to make sure you have everything you'll need.

4.2 Quick Setup Instructions

Follow these setup steps every time you begin monitoring a patient. See Detailed Setup Instructions in this chapter for a thorough explanation of each step.

1. Choose the installation site.
2. Check the monitor's AC rating.
3. Connect the AC power cord.
4. Press the ON/OFF key to turn on the monitor.
5. Set the patient information.
6. Use the main menu to define some general configuration information and parameter options.
7. If necessary, set the time and date on the display.

4.3 Detailed Setup Instructions

1. Set up the monitor in a room with a temperature of 0-50° C and a relative humidity of 15-95%, non-condensing.

a. If the monitor was in an area having a temperature higher or lower than this, wait a few minutes before setting up and using the monitor.

2. Check the monitor's AC rating. Check the monitor's AC rating plate to ensure the nominal voltage at your installation site matches the monitor's rating.

a. If the AC rating is not correct, do not use the monitor. Contact your authorized repair center for help.

3. Plug the AC power cord into the power connector on the back of the monitor.

4. Plug the other end of the AC power cord into a grounded, three-wire hospital-grade outlet.

5. Verify that the front panel AC Power LED is lit.

WARNING! Do not plug the monitor into an outlet controlled by a wall switch.

6. Press the ON/OFF key to turn on the monitor.

a. The display will light up, the monitor will begin a brief system check, and then automatically enter the monitoring mode.

NOTE! The monitor performs a number of systems checks during its start-up time. If the monitor detects an error with its internal circuitry, a message is displayed and the monitor will not enter the monitoring mode.

4.4 Basic Operation

Press the menu key to pop us the main menu. There are 8 options at the main menu which shows as follow,

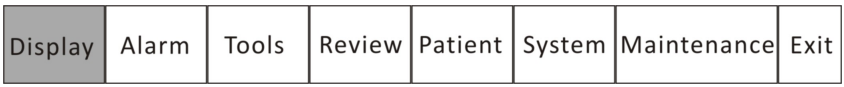


Figure 4.1: Main Menu

OPTIONS	INSTRUCTION
Display	Set the display modes.
Alarm	Adjust the alarm limits for parameters, open/ close the alarm switches.
Tools	Choose event and perform drug calculation.
Review	Review the trend data, graph and alarms stored on the monitor.
Patient	Select patient type, sex, add patient name, age and bed number.
System	Setup system information.
Maintenance	Back to default settings and conduct some maintenance

4.5 Systems Setup

Press the menu key to pop up the main menu and turn the rotary knob on the monitor to move the cursor to the “System” option. Then press the rotary knob to enter its submenu. The setup window will be shown as below,

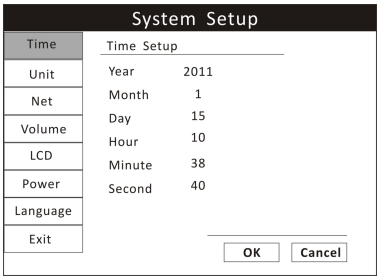


Figure 4.2: System Setup

4.5.1 Time Setup

If necessary, set the time and date on the display. The time and date indicator is located in the lower right corner of the display. The monitor's real-time clock and calendar keep track of the time and date, even when the monitor is turned off or is not connected to AC power. The time and date stamp is used for the NIBP tabular trends, the displayed and printed trends, and all other printouts. The time display format is based on the 24-hour clock. For example, 5:00 a.m. is displayed as 5:00 and 5:00 p.m. is displayed as 17:00.

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Time” option.

3. Push the rotary knob to access the time setup submenu and turn the knob to highlight the desired option.

4. Push the rotary knob to select the option. Turn the rotary knob to increase or decrease the value. Press it again to move out.

5. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

4.5.2 Unit Setup

Units of measurement can be changed for TEMP and NIBP. The selected units of measurement will remain in the monitor's memory until changed, even if the monitor is turned off.

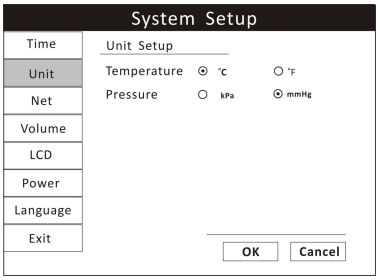


Figure 4.3: Unit Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Unit” option.

3. Push the rotary knob to access the unit setup submenu and turn the knob to highlight the desired unit and push to select.

TEMP can be changed to degrees Celsius (^{0}C) to degrees Fahrenheit (^{0}F).

- $^0C = 5\times (^0F - 32)/9$
- $^0F = 9\times {}^0C /5+32$

PRESSURE can be changed to millimeters of mercury (mmHg) or kilopascals (kPa). The default setting is mmHg.

- kPa = mmHg X 0.133
- mmHg = kPa / 0.133

4. Turn the rotary knob to “OK” or “Cancel” button and push to save or delete your settings.

4.5.3 Net Setup

When connecting the monitor to a computer or a center monitor, you need to setup the IP address.

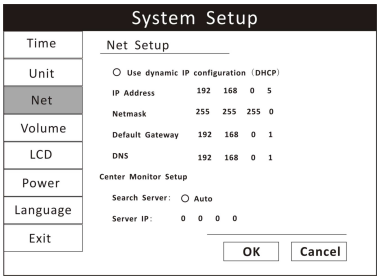


Figure 4.4: Net Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Net” option and push the knob to select.

3. You can choose to use dynamic IP configuration or set the IP address manually.

4. Turn the rotary knob to “OK” or “Cancel” button and push to save or delete your settings.

4.5.4 Volume Setup

You can adjust the volume of the audible alarm and pulse rate to one of seven levels separately. When an alarm occurs (and alarm silence is not enabled), the alarm tones will sound at the chosen volume. The default alarm and pulse volume settings are the fourth level. You cannot set the alarm volume to OFF.

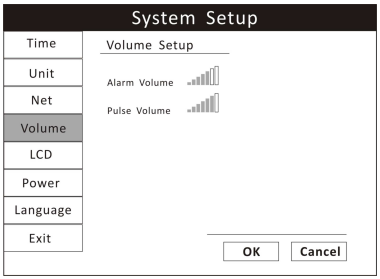


Figure 4.5: Volume Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Volume” option.

3. Push the rotary knob to access the volume setup submenu and turn the knob to highlight the desired volume and push to select.

4. Turn the knob to increase or decrease the volume and push it to exit.

5. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

4.5.6 LCD Brightness Setup

You can set the brightness of the LCD display. There are seven levels of brightness. And the default setting is the seventh level.

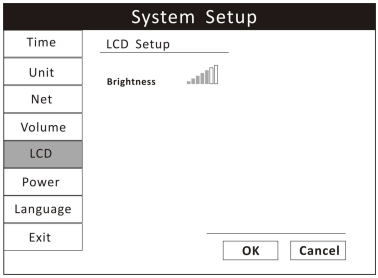


Figure 4.6: LCD Brightness Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “LCD” option.

3. Push the rotary knob to access the LCD setup submenu and turn the knob to highlight the brightness and push to select.

4. Turn the knob to increase or decrease the level of brightness and push it to exit.

5. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

4.5.7 Power Setup

When the monitor is connected to an AC power source, the frequency should be set relatively.

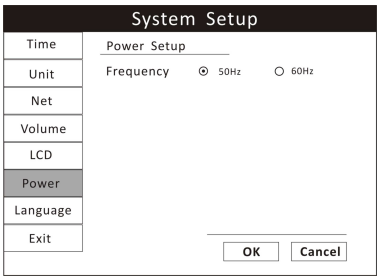


Figure 4.7: Power Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Power” option.

3. Push the rotary knob to access the power setup submenu and turn the knob to highlight the desired frequency and push to select.

4. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

4.5.8 Language Setup

There are two languages available in this monitor: Chinese and English.

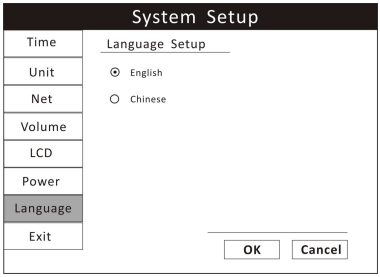


Figure 4.8: Language Setup

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “System” option.

2. Push the rotary knob to access the “System” submenu. Turn the knob to highlight the “Language” option.

3. Push the rotary knob to access the language setup submenu and turn the knob to highlight the desired language and push to select.

4. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

4.6 Set Patient Information

4.6.1 How to use the keyboard

To enter characters and data to the monitor, the on-screen keyboard will be used. If there is information needs to be entered, push the rotary knob and then the on-screen keyboard will pop up.

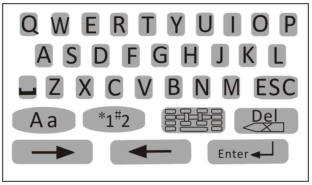


Figure 4.9: On-screen Keyboard

BUTTONS	INSTRUCTION
	Spacebar. Press it when a space is needed.
	Press this key to access the character board.

ESC	Press this key to exit the character board.
Aa	Press it to change the character board into letters and switch between capital and lowercase letters.
*1#2	Press it to change the character board into numbers and punctuation.
Del	Delete button.
→ ←	Press these two buttons to move the cursor.
Enter	Press it to confirm your writings.

4.6.2 Patient Setup

The monitor displays physiological data and stores it in the trends as soon as a patient is connected. Before monitoring a patient, the doctor should input the patient information correctly.

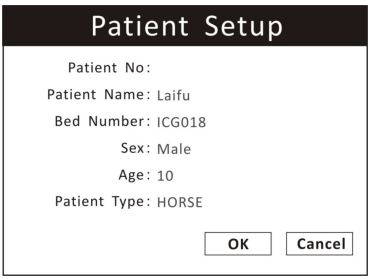


Figure 4.10: Patient Setup

When monitoring a cat or small animal, set the monitor to cat type. When monitoring dogs or medium-size animals, set the monitor to the dog type. When monitoring horses or large animals, set the monitor to the horse type.

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “Patient” option and push to select.

2. Enter the patient information: select each field and use the on-screen keyboard or choose from alternatives to input information.

ITEMS	INSTRUCTION
NO.	Enter the patient’s medical record number, for example 678.
Name	Enter the patient’s first name and last name (family name).
Bed Number	Enter the patient’s bed number, for example: ICU007.
Sex	Choose Male or Female.

Age	Enter the patient's age, for example: 10
Patient Type	Choose the patient's type: DOG, CAT and HORSE.

3. Turn the rotary knob to "OK" or "Cancel" button and push it to save or delete your settings.

4.7 Display Setup

Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the "Display" option and push it to select.

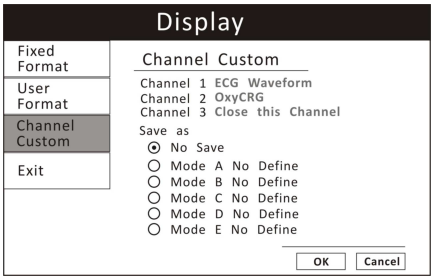
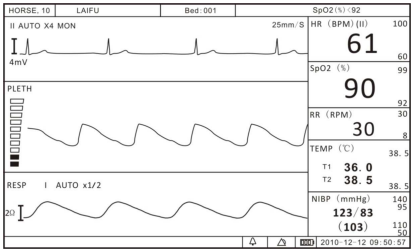
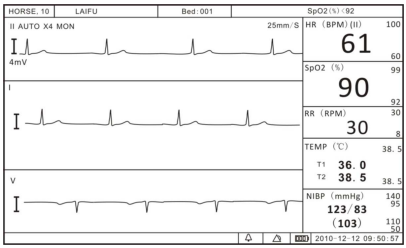


Figure 4.11: Display Setup

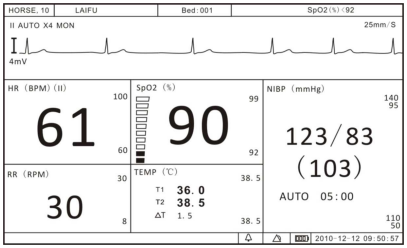
There are four main fixed display modes, and you can switch between them by pressing the Mode key.

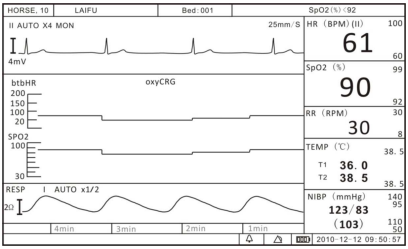


a). 1 ECG Display Mode



b). 3 ECG Display Mode





c). Huge Digit Display Mode

d). oxyCRG Display Mode

4.7.1 Customize Display Modes

Besides the above four main display modes, user can also customize the display modes and save as user format modes.

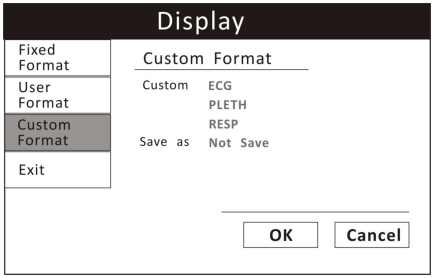


Figure 4.12: Custom Format

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “Display” option.

2. Push the rotary knob to access the “Display” submenu. Turn the knob to highlight the “Custom Format” option.

3. Push the rotary knob to access the custom format submenu. There are three waveform channels. You can customize each channel by choosing from ECG, PLETH, Graph, Table, RESP or blank.

4. Push the rotary knob to select and choose the desired display option.

5. Turn the rotary knob to highlight “Not Save”, push to select and turn knob to choose a format such as Format 1 to save your settings.

6. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

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Chapter 5: Monitoring the Patient

Follow the steps in Chapter 4: Setting Up the Monitor; the remainder of this chapter assumes that the monitor is properly installed and set up.

5.1 General Monitoring Instructions

Regardless of the parameters or measured values you want to monitor, follow these steps when you are ready to attach a patient. Each step is further explained in this chapter.

1. Attach the patient and sensors.

2. Choose the waveforms to be displayed.

3. Adjust the settings in the parameter boxes.

4. Set the high and low alarm limits.

5. Use these features as needed:
   - Responding to an alarm
   - NIBP Mode
   - Freeze Mode
   - Trends
   - Viewing Stored Trend Data

5.2 Attach the Patient

Attach the patient to the desired sensors and connect the sensor cables to the monitor.

Parameters' values will automatically appear on the display when the sensor cable is connected to the monitor.

5.3 Adjust the Waveforms Settings

Choose the waveforms, trend table, graph or blank to be displayed in the three waveform channels by using the Display Setup function and adjust the settings of each waveform.

Push and turn the rotary knob on the monitor to move the cursor. Highlight the waveform channel and push the knob to access the waveform menu in the

middle of the display. The settings available for selected waveform will be displayed.

Refer the chapters dedicated to each parameter for more details regarding waveform settings.

5.4 Adjust the Parameter Box Settings

1. Turn the rotary knob on the monitor to move the cursor. Highlight the parameter box and push the knob to access the parameter menu in the middle of the display. The settings available for the selected parameter will be displayed.

2. Every parameter allows you to turn on or off its alarm detection capability in the parameter menu. For example, if SpO_2 alarm is on, an alarm will be issued when the high or low alarm limit is violated. If you turn SpO_2 alarm off and the high or low alarm limit is violated, an alarm will not be issued.

NOTE! When you change the patient type or power down, this setting will default to ON.

3. For the parameters where more than one measurement can be monitored such as blood pressure (systolic, diastolic, and mean), only the settings of SYS and DIA's high and low limits can be displayed.

5.5 Set Alarm Limits

Set the high and low alarm limits for each parameter.

• When a numeric measured value matches or exceeds the high or low limit set for that parameter, an alarm is issued. For example, if the low alarm limit for SpO_2 is 85 and the patient's measured value for SpO_2 is 85 or less, an alarm will be issued.

•The Vital Signs Monitor provides clinically appropriate default high and low alarm limits for each numeric measured value. You can choose different high and low limits, depending on the monitoring requirements of each patient. For a list of default alarm limits, see Chapter 15: Specifications.

WARNING! Verify that alarm limits are clinically appropriate for your patient and adjust according to institutional policy.

NOTE! Alarms may be tested while the monitor is in use by setting alarm limits such that the measured value is outside the limits. Return the alarm limits to their clinically appropriate settings after testing.

To set the high and low alarm limits:

1. Be sure that the sensor for each parameter is connected to the monitor, and the parameter or measured value is shown on the display.

2. Press the menu key to pop up the main menu at the bottom of the display. Turn the rotary knob on the monitor to move the cursor, highlight “Alarm” and push the knob to select.

3. Highlight the name of each measured value and push the knob to select.

4. Highlight the high alarm limit and push the knob to select.

5. Turn the rotary knob to choose the desired value and push the knob to select.

6. Turn the rotary knob to highlight the low alarm limit and push the knob to select.

7. Turn the rotary knob to choose the desired value and push the knob to select.

8. Turn the rotary knob to “OK” or “Cancel” button and push it to save or delete your settings.

5. 6 Use these Features as Needed

5.6.1 Responding to an Alarm

1. When a numeric measured value matches or exceeds the high or low limit set for that parameter, an alarm is issued. An audible alarm tone will sound, alarm event will appear in the alarm status bar, and the violating measured value will flash in the parameter box.

2. The alarming action will cease when the measured value is once again within the alarm limits. Your monitor will either automatically stop alarming as soon as the measured value returns to within the alarm limits, or it will require you to manually acknowledge the alarm by pressing the alarm silence key.

NOTE! Only qualified personnel may silence the alarm temporarily, or enable it indefinite.

3. If the alarm limit is still violated after two minutes, the audible alarm tone will sound again. If, within the two minutes of alarm silence, another measured value matches or exceeds its alarm limits, the alarming action will resume, including the audible alarm tone.

4. If it is appropriate for your patient, you can turn off the alarm detection capability for a single parameter so that when the measured value matches or exceeds the alarm limits, the monitor will not issue an alarm.

5.6.2 NIBP Mode

Non-invasive blood pressure (NIBP) measurements can be made in automatic, manual, or STAT modes. In the automatic mode, the monitor will measure the patient's NIBP periodically, according to the interval you select. In the manual mode, the monitor will measure the patient's NIBP only when you press the NIBP key. In the STAT mode, the monitor will measure the patient's NIBP continuously for five minutes.

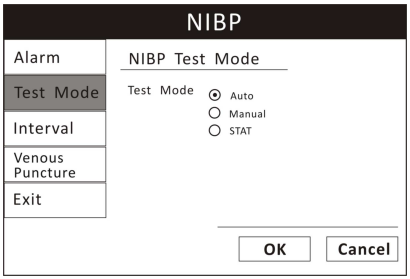


Figure 5.1: NIBP Mode

To change the NIBP mode:

1. Push and turn the rotary knob on the monitor to move the cursor. Highlight the NIBP parameter box and push to select.

2. Highlight the test mode and push the rotary knob select.

3. Turn the rotary knob to choose a mode (Auto, Manual, or Stat), and push the knob to select.

5.6.3 Freeze Mode

Use this feature to temporarily hold or freeze all current waveforms, even those that are not displayed. Monitoring does not stop; you can still view the current measured values in the parameter boxes.

When you freeze the waveforms, you may not adjust any waveform settings.

In addition, attempting to perform any other functions will cause the freeze mode to be cancelled. For example, if you freeze the waveforms and then select ALARMS from the main menu, the alarm limits box will be displayed in the waveform area and the waveforms will no longer be in freeze mode.

To freeze the waveforms:

1. Press the Freeze key on the right side of the monitor. The waveforms will stop, or freeze.

2. Press the “Page Up” or “Page Dn” to browse the waveform and press “Save” to store the frozen waveform section in a file.

3. To start the waveforms again, press the Freeze Key again.

5.6.4 Trends

The monitor stores tabular trend data graph every 10 seconds for up to 120 hours for the following parameters:

a. ECG

- Heart Rate
- ST

b. Oximetry

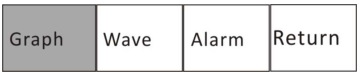
- Oxygen saturation (SpO_2)
- Pulse rate, when SpO_2 is the selected heart rete source

c. Non-invasive blood pressure (NIBP) (systolic, diastolic, mean)

d. Temperature (T1 and T2)

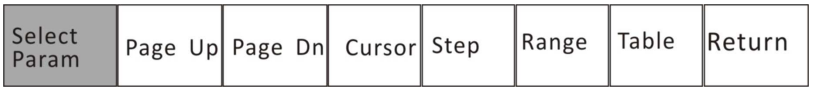
5.6.5 Viewing Stored Trend Data

To view the stored trend data, press the menu key and turn the rotary knob on the monitor to move the cursor to “Review” option and push to access the review submenu shown as below.



1. Review Trend Graph

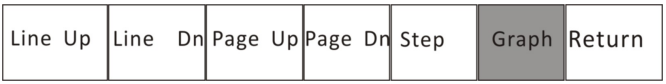
In the review submenu, highlight the “Graph” and push the rotary knob to select. The monitor will display the trend graph and the following menu.



ITEMS	INSTRUCTION
Select Parameter	Select a parameter: HR, ST, SpO_2, NIBP, RR, or T1/T2 and push the rotary knob to select. The corresponding trend graph will be displayed in the trend graph display area.
Page up/ Dn	Browse the time frame of the trend graph.
Cursor	Use to select points on the trend graph.
Step	Select the time intervals between data points. The trend graph will be adjusted accordingly. The available time intervals are 1 second, 5 seconds, 10 seconds, 20 seconds, 30 seconds, 60 seconds, 90 seconds and 120 seconds.
Range	It is used to designate the Y axis value range of the trend graph. The adjusted range will be stored in the monitor and will be applied when the monitor restarts. The range has three adjustment modes: alarm limit range, maximum range, and manual adjustment. Once the user sets the range, the trend graph displays data within the upper limit/lower limit of this range. Any value over the limit is not valid.
Table	Select this option to access the trend table display.

2. Review Trend Table

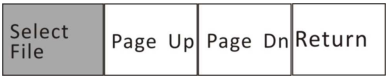
The information in the trend table is displayed as a list. The available number and categories of parameters are the same as with the trend graph. In the trend table, the median time is the cursor time value in the trend graph. The value of each parameter is date and time (except NIBP). The NIBP value is the first value in the current interval.



ITEMS	INSTRUCTION
Line Up/Dn	Browse the time frame.
Page Up/ Dn	
Step	The trend table's data compress or append according to step. The available steps are 1 minute, 5 minutes, 10 minutes, 20 minutes, 30 minutes and 1 hour.
Graph	Select this option to back to the trend graph display.

3. Review Freeze Wave

In the review submenu, highlight the "Wave" and push the rotary knob to select. The following menu will be displayed:



ITEMS	INSTRUCTION
Select File	Select a saved file to review.
Page up/ Dn	Browse frozen waveform page by page.

4. Review Alarms

The user can review 1000 alarm records.

In the review submenu, highlight the "Alarm" and push the rotary knob to select. The monitor will display the stored alarms for all the parameters.

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Chapter 6: Alarms

6.1 Parameter Alarms and Technical Alarms

A parameter alarm occurs when a numeric measured value matches or exceeds the high or low limit set for that parameter.

A technical alarm occurs when there is a malfunction with any of the sensors or connections, or when the battery is low or when an error is detected during self-test.

During an alarm, an audible alarm tone will sound and a message will be displayed in the alarm status bar at the top of the display. For parameter alarms, the violating measured value will flash.

6.2 High, Medium, and Low Priority Alarms

Caution! Only qualified doctors can set the physiological parameters' upper limits for alarm level according to patient's conditions.

Alarms are categorized as high priority, medium priority, or low priority.

High Priority Alarms

A high priority alarm sound consists of two bursts of five single tones over a four-second interval. The sequence is repeated every ten seconds. High priority alarms supersede all other alarms. The alarm message will be displayed in the alarm status bar with a red flashing background; the violating measured value will flash in red.

CAUTION! When different priority alarms occur simultaneously, only the highest priority alarm is displayed.

Medium Priority Alarms

A medium priority alarm sound consists of two bursts of three single tones that repeats every 18 seconds. The alarm message will be displayed in the alarm status bar with a yellow flashing background; the violating measured value will flash in red.

Low Priority Alarms

A low priority alarm sound consists of a single burst of one single tone that repeats every 20 seconds. The alarm message will be displayed in the alarm status bar with a yellow flashing background; the violating measured value will not flash.

Alarm Priority Chart

Alarm Content	Type	Priority
HR	Over limit	above medium
SpO2	Over limit	above medium
ST	Over limit	Set priority based on patient conditions
RR	Over limit	
NIBP	Over limit	
Temperature	Over limit	
(SpO2) pulse search over due	Parameter alarm	high
(ECG) lead off	Technical alarm	high
(ECG) channel full	Technical alarm	high
(SpO2) sensor off	Technical alarm	high
(SpO2) without sensor	Technical alarm	high
(NIBP) cuff leakage	Technical alarm	high
(NIBP) without cuff	Technical alarm	high
(NIBP) cuff over pressure	Technical alarm	high
(NIBP) test over time limit	Technical alarm	high

6.3 Controlling Alarms

You can control many factors in the way the monitor issues an alarm. You can turn off the alarm detection capability for a single parameter. You can change the high and low alarm limits. You can quickly reset the alarm limits relative to the patient's current measured values. You can control the volume of the audible alarm. And you can silence an alarm for two minutes, or indefinitely.

CAUTION! When the overall alarm is switched off and physiological parameters exceed limits, there will be no alarm sound and no blinking numerics. The words relating to the technical alarm will blink but without audible sound.

WARNING! User should pay careful attention to overall alarm switching. Switching off the overall alarm is not recommended.

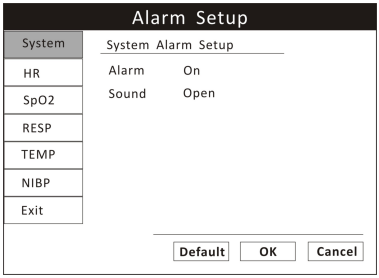

Figure 6.1: Alarm Setup

To change alarm settings,

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “Alarm” option and push the knob to select.

2. Highlight the “System” option and push to select. You can turn on/off overall alarm switches for all the parameters. You can also silence the overall alarm sound temporarily or indefinitely.

3. To change of alarm settings for a single parameter, you can highlight each parameter option and change the settings according. Or you can access their parameter menu to change the settings.

4. Turn the rotary knob to “OK” or “Cancel” button and push to save or delete your settings.

6.3.1 Change alarm limits

The monitor provides clinically appropriate default high and low alarm limits for each numeric measured value. You can change the high and low alarm limits, depending on the monitoring requirements of each patient. You can even set a high or low alarm limit to OFF, so that no alarm will be issued. Check the list of default alarm limits at the chapter of specification.

WARNING! Alarm high limit cannot be lower than low limit. If high limit is lower than low limit, the monitor will not respond.

WARNING! When the monitor is turned on for the first time, it will default to the alarm configuration for a horse.

WARNING! The alarm settings are set to factory defaults. Once reset according to patient conditions, current alarm settings are saved for up to 30 minutes after the monitor is turned off. If the monitor is not turned back on for 30 minutes, alarm limits are automatically reset to factory defaults.

WARNING! If patient information has been reset, the user should reset alarm limits based on new "patient type".

6.3.2 Silence alarms

The monitor is set to allow temporary or indefinite audio alarm silence, then pressing the Alarm Silence key in turn while audible alarms are enabled will do one of the following:

•Press the Alarm Silence key once. A 30-seconds timer will appear at the right side of the Alarm Since icon. Audible alarms will not be re-enabled if any new alarm occurs. They will only be re-enabled if the 30-seconds timer times out, or if the Alarm Silence key is pressed again.

•Press the Alarm Silence key twice. A 60-seconds timer will appear at the right side of the Alarm Since icon. Audible alarms will not be re-enabled if any new alarm occurs. They will only be re-enabled if the 60-seconds timer times out, or if the Alarm Silence key is pressed again.

•Press the Alarm Silence key for three times. A 90-seconds timer will appear at the right side of the Alarm Since icon. Audible alarms will not be re-enabled if any new alarm occurs. They will only be re-enabled if the 90-seconds timer times out, or if the Alarm Silence key is pressed again.

•Press the Alarm Silence key for four times. A 120-seconds timer will appear at the right side of the Alarm Since icon. Audible alarms will not be re-enabled if any new alarm occurs. They will only be re-enabled if the 120-seconds timer times out, or if the Alarm Silence key is pressed again.

•Press the Alarm Silence key for five times. The Alarm Since icon will be displayed with a cross and no timer. Audible alarms will not be re-enabled if any new alarm occurs. They will only be re-enabled if the Alarm Silence key is pressed again.

NOTE! Only qualified personnel may change the allowed alarm audio silence mode.

Chapter 7: ECG

7.1 ECG Measurement Capability

The Vital Signs Monitor provides continuous five-lead ECG processing with standard lead selections and filtering from electrocautery discharge. The heart rate measured value (HR) and primary lead messages are displayed in the HR parameter box, and a waveform for the primary ECG lead is continuously displayed.

7.2 ECG Warnings, Cautions, and Notes

WARNING! Connect only five-lead ECG lead wires from the patient to the ECG patient cable. Do not connect any other signal source to the ECG patient cable.

WARNING! This monitor does not identify or interpret arrhythmia events. The indication of heart rate may be adversely affected by the presence of cardiac arrhythmias.

CAUTION! Only five-lead ECG cable can be used to this monitor. Using the incorrect cable for the selected mode might lead to a floating reference or additional noise on the ECG signal.

NOTE! Follow institutional standards when applying ECG electrodes. Silver/Silver Chloride disposable electrodes are strongly recommended to avoid polarization effects that result in large input offset potentials. Use of "squeeze bulb" type electrodes is not recommended.

NOTE! Line isolation monitor transients may resemble actual cardiac waveforms and thus inhibit heart rate alarms.

7.3 Theory of Operation

Electrical currents influenced by the cardiac impulse flow through the body tissue around the heart. Three or five electrodes, placed on the skin on opposite sides of the heart, transmit the electrical potentials to circuitry in the monitor.

The monitor's ECG circuitry amplifies, filters, and digitizes (converts analog signals to digital signals) the received electrical potentials. The digitized signals are used to display the ECG waveform and calculate the ECG heart rate

7.4 Attaching the Patient

NOTE! Follow institutional standards when applying ECG electrodes.

NOTE! The monitor is protected against damage from defibrillator, diathermy, and electrocautery discharge.

1. Skin Preparation for Electrode Placement

Good electrode-to-skin contact is important for a good ECG signal, as the skin is a poor conductor of electricity.

a) Select sites with intact skin, without impairment of any kind.

b) Clip or shave hair from sites as necessary.

c) Wash sites thoroughly with soap and water, leaving no soap residue.

We do not recommend using ether or pure alcohol, because this dries the skin and increases the resistance.

d) Dry skin thoroughly by rubbing briskly to increase capillary blood flow in the tissues.

e) Use ECG skin preparation (abrasive) paper to remove dead skin cells and to improve the conductivity of the electrode site.

2. Connecting ECG Leads

a) Attach the clips or snaps to the electrodes before placing them. If you are not using pre-gelled electrodes, apply electrode gel to the electrodes before placement.

b) Place the electrodes on the patient.

NOTE! To remove the ECG cable, grip the connector and pull back firmly. DO NOT pull on the ECG cable to remove the ECG connector from the monitor.

Standard 5-Lead Placement

ECG 5-LEAD ELECTRODE INDENTIFICATION		
Electrode Label	Location	Color
RA	Right Arm	White
RL	Right Leg	Green
LA	Left Arm	Black
LL	Left Leg	Red
V	4the Intercostal(left)	Brown

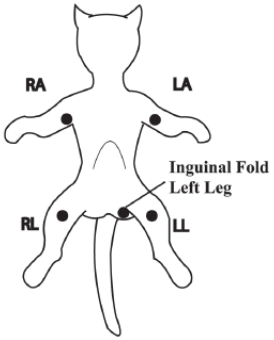

Figure 7.1: 5-Lead Placement

WARNING! Electrodes of dissimilar metals should not be used.

CAUTION! To protect the monitor from damage during defibrillation, for accurate ECG information and to protect against noise and other interference, use only ECG electrodes and cables specified by Utech.

3. Place the ECG leads to the patient. Be sure that the leads are in the correct ECG cable position. The ECG leads and patient cable connector are color-coded.

CAUTION! Ensure conductive parts, including electrodes of the patient cable, do not come into contact with any conductive surfaces or earth parts.

The monitor will automatically detect when the ECG cable is connected. Heart rate (HR) will be displayed in the HR parameter box and the primary ECG waveform will appear on the waveform channel.

7.5 Choosing the Waveform Settings

Use the ECG waveform menu options to choose the primary ECG lead and adjust the settings for the size and speed of the ECG waveform.

7.5.1 Access the ECG Waveform Menu

The ECG waveform menu is accessible from any ECG waveform channel.

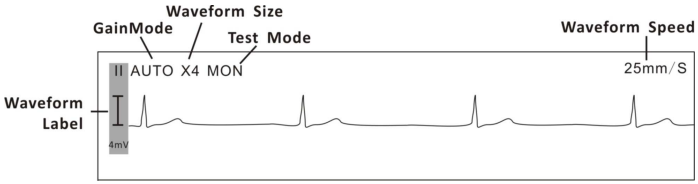

Figure 7.2: ECG Display

To access the ECG waveform menu from the waveform channel:

1. Push and turn the rotary knob on the monitor to move the cursor.

2. Highlight the waveform channel for primary ECG lead and push the knob to select. The ECG waveform menu will appear in the middle of the display.

7.5.2 Change the Primary ECG Lead

Lead II is the default primary lead. You can designate any other lead to be the primary using the ECG waveform menu. The selected primary lead will be displayed in the waveform label.

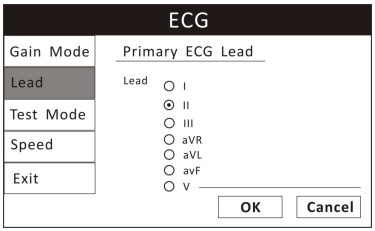

Figure 7-3: Set Primary ECG Lead

To change the primary lead:

1. On the ECG waveform menu, highlight LEAD and push the knob to access the ECG leads submenu.

2. Highlight the desired primary ECG lead and push the knob to select. See the following tables for the primary lead configuration.

ECG 5-LEAD CONFIGURATION		
I	Lead I Configuration	RA-LA
II	Lead II Configuration	RA-LL
III	Lead III Configuration	LA-LL
V	Lead V Configuration	LA-V
AVF	Augmented Lead AVF	
AVL	Augmented Lead AVL	
AVR	Augmented Lead AVR	

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.5.3 Choose the Waveform Size

If any of the displayed ECG waves is too small or clipped, you can change the size of the ECG waveforms on the display. The selected size (X1/4, X1/2, X1, X2, or X4) will appear in the waveform channel. The default size is times one (X1).

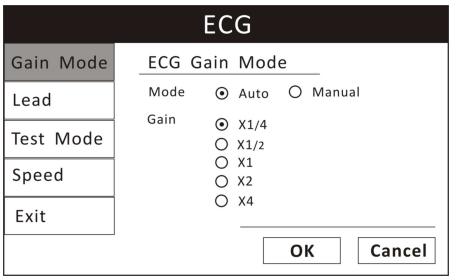

Figure 7.4: Choose Waveform Size

To change the size of the ECG waveform:

1. On the ECG waveform menu, highlight Gain Mode and push the knob to select.

2. Highlight the desired size of the waveform (X1/4, X1/2, X1, X2, or X4) and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.5.4 Choose the Waveform Speed

You can choose the speed at which the ECG waveform is updated.

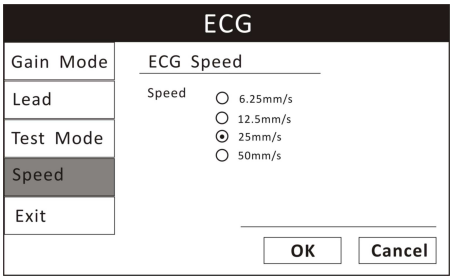

Figure 7.5: Choose Waveform Speed

To change the speed of the ECG waveform:

1. On the ECG waveform menu, highlight Speed and push the knob to select.

2. Highlight the desired speed of the waveform (6.25, 12.5, 25, or 50 mm/second) and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.6 Adjusting the Settings in the Parameter Box

7.6.1 HR Alarm Setup

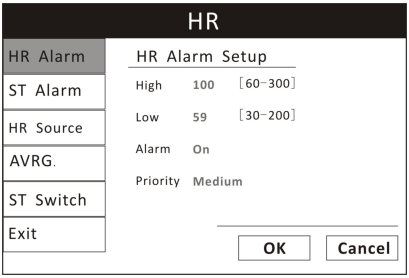

Figure 7.6: HR Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for the heart rate value. If HR ALARMS is on, an alarm will be issued when the high or low alarm limit is violated. If you turn HR ALARMS off and the high or low alarm limit is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, HR ALARMS will be reset to ON; the default setting is ON. See Choose the Heart Rate Source in this chapter for information regarding the source of the measured value for heart rate.

To turn on or off the heart rate alarm detection:

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight HR ALARM and push the knob to select.

c) Choose ON or OFF and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight HR ALARM and push the knob to select.

c) Move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight HR ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.6.2 Choose the Heart Rate Source

The Vital Signs Monitor can measure the heart/pulse rate using two different parameters: ECG and oximetry (SpO_2). Regardless of the source, the measured value for heart rate can be continuously displayed in the HR parameter box. You can choose the source (AUTO, ECG or SPO2) of the heart/pulse rate displayed. The default setting is AUTO.

If you choose ECG, the primary lead label (II) will show in the HR parameter box at the detection of each QRS complex in the waveform. If you choose SpO_2 as the source, the SPO2 label identifying the source will be displayed in the HR parameter box at the detection of a pulse.

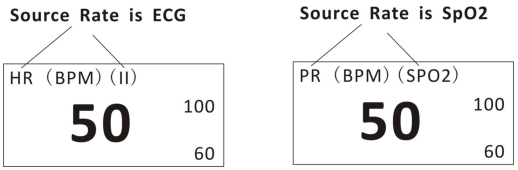

Figure 7.7: Heart Rate Source

If you choose AUTO, the monitor will determine the best source depending on the quality of available data and the following source priority:

a. If the ECG cable is connected to the monitor, and the ECG reading is valid, then ECG will be the heart rate source.

b. If ECG cable is not connected or the signal is otherwise undetected, an oximetry cable (SpO_2) is connected to the monitor, and the SpO_2 reading is valid, then SpO_2 will be the heart rate source.

To choose the source of the heart rate displayed in the HR parameter box:

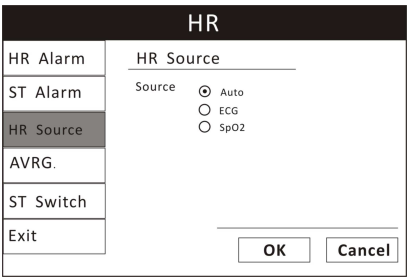

Figure7.8: Choose HR Source

1. Push and turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

2. Highlight HR Source and push the knob to select.

3. Choose the desired source of the measured value for heart rate (AUTO, ECG, or SpO_2) and push the knob to select.

4. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.7 Monitoring ST

The monitor performs ST segment analysis on normal and atrially paced beats and calculates ST segment elevations and depressions. This information can be displayed in the form of ST numerics and snippets on the monitor.

7.1.1 Turn on the ST Switch

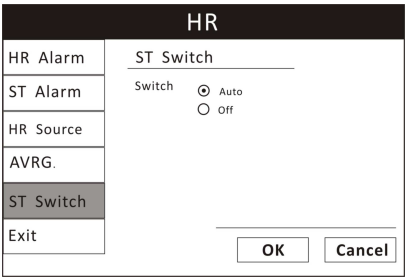

Figure7.9: Turn on ST Switch

1. Push and turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

2. Highlight the ST switch and push the knob to select.

3. Choose AUTO or OFF and push the rotary knob to select.

4. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

7.1.2 ST Display

The ST section will be displayed in the HR parameter box after you turn on the ST switch.

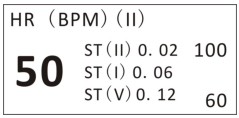

Figure 7.10: ST Display

7.1.3 ST Alarm Setup

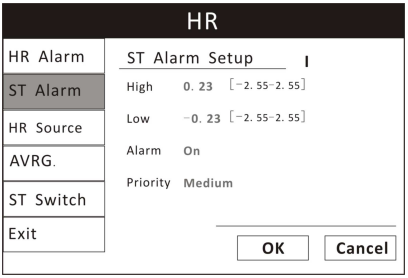

Figure 7.11: ST Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for the heart rate value. If ST ALARMS is on, an alarm will be issued when the high or low alarm limit is violated. If you turn ST ALARMS off and the high or low alarm limit is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, ST ALARMS will be reset to ON; the default setting is ON.

To turn on or off the ST alarm detection:

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight ST ALARM and push the knob to select.

c) Choose the source of ST section from lead I, II, III, aVR, aVL, aVF, V.

d) Choose ON or OFF and push the knob to select.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight ST ALARM and push the knob to select.

c) Move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the HR parameter menu.

b) Highlight ST ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

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Chapter 8: Oximetry

8.1 Oximetry Measurement Capability

The oximetry parameter provides the continuous non-invasive monitoring of oxygen saturation (%SpO_2) in the blood and peripheral pulse rate (PPR). The measured values for oximetry (%SpO_2 and PPR) and a pulse strength bar graph are displayed in the SpO_2 parameter box. A plethysmogram, or oxygen saturation waveform can be continuously displayed. A variety of reusable sensors is available for monitoring patients.

8.2 Oximetry Warnings, Cautions, and Notes

WARNING! Prolonged use or the patient's condition may require changing the sensor site periodically. Change the sensor site and check skin integrity, circulatory status, and correct alignment at least every 4 hours.

WARNING! When attaching sensors with micro foam tape, do not stretch the tape or attach the tape too tightly. Tape applied too tightly may cause inaccurate readings and blisters on the patient's skin (lack of skin respiration, not heat, causes the blisters).

WARNING! Using a damaged sensor may cause inaccurate readings, possibly resulting in patient injury or death. Inspect each sensor. If a sensor appears damaged, do not use it. Use another sensor or contact your authorized repair center for help.

WARNING! Using a damaged patient cable may cause inaccurate readings, possibly resulting in patient injury or death. Inspect the patient cable. If the patient cable appears damaged, do not use it. Contact your authorized repair center for help.

WARNING! If any of the integrity checks fail, do not attempt to monitor the patient. Use another sensor or patient cable, or contact the equipment dealer for help if necessary.

WARNING! Do not autoclave, ethylene oxide sterilize, or immerse the sensors in liquid. Evidence that liquid has been allowed to enter the monitor voids the warranty.

WARNING! Use only SpO_2 sensors supplied with, or specifically intended for use with, this device.

WARNING! SpO_2 measurements may be adversely affected in the presence of high ambient light. Shield the sensor area (with a surgical towel, for example) if necessary.

WARNING! Dyes introduced into the bloodstream, such as methylene blue, indocyanine green, indigo carmine, patent blue (PBV), and fluorescein may adversely affect the accuracy of the SpO_2 reading.

WARNING! Any condition that restricts blood flow, such as use of a blood pressure cuff or extremes in systemic vascular resistance, may cause an inability to determine accurate SpO_2 and pulse rate readings.

CAUTION! Unplug the sensor from the monitor before cleaning or disinfecting.

NOTE! Obstructions or dirt on the sensor's red light or detector may cause a sensor failure. Make sure there are no obstructions and the sensor is clean.

8.3 Pulse Oximetry Theory of Operation

The pulse oximeter determines %SpO_2 and pulse rate by passing two wavelengths of low intensity light, one red and one infrared, through body tissue to a photodetector. Information about wavelength range can be especially useful to clinicians. Wavelength information for this device can be found in the *SpO_2 Specifications* section of this manual.

Pulse identification is accomplished by using plethysmographic techniques, and oxygen saturation measurements are determined using spectrophotometric oximetry principles. During measurement, the signal strength resulting from each light source depends on the color and thickness of the body tissue, the sensor placement, the intensity of the light sources, and the absorption of the arterial and venous blood (including the time varying effects of the pulse) in the body tissues.

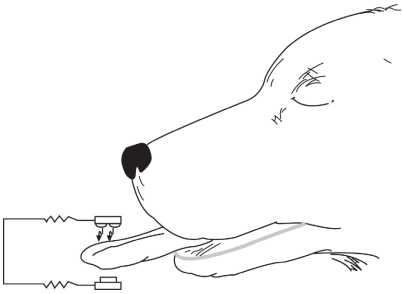

Figure 8.1: Theory of Operation

1. Low intensity Red and Infrared LED light sources
2. Detector

Oximetry processes these signals, separating the time invariant parameters (tissue thickness, skin color, light intensity, and venous blood) from the time variant parameters (arterial volume and SpO_2) to identify the pulses and calculate functional oxygen saturation. Oxygen saturation calculations can be performed because blood saturated with oxygen predictably absorbs less red light than oxygen-depleted blood.

WARNING! Since measurement of SpO_2 depends on a pulsating vascular bed, any condition that restricts blood flow, such as the use of a blood pressure cuff or extremes in systemic vascular resistance, may cause an inability to determine accurate SpO_2 and pulse rate readings.

WARNING! Under certain clinical conditions, pulse oximeters may display dashes if unable to display SpO_2 and/or pulse rate values. Under these conditions, pulse oximeters may also display erroneous values. These conditions include, but are not limited to: patient motion, low perfusion, cardiac arrhythmias, high or low pulse rates or a combination of the above conditions. Failure of the clinician to recognize the effects of these conditions on pulse oximeter readings may result in patient injury.

8.4 Attaching the Patient

WARNING! Prolonged use or the patient's condition may require changing the sensor site periodically. Change the sensor site and check skin integrity, circulatory status, and correct alignment at least

every 4 hours.

WARNING! When attaching sensors with Microfoam tape, do not stretch the tape or attach the tape too tightly. Tape applied too tightly may cause inaccurate readings and blisters on the patient's skin (lack of skin respiration, not heat, causes the blisters).

1. Choose a sensor to be used to monitor oximetry.

2. Clean and disinfect the sensor. Use a soft cloth moistened in water or a mild soap solution, and then wipe the sensor with isopropyl alcohol.

WARNING! Do not autoclave, ethylene oxide sterilize, or immerse the sensors in liquid. Evidence that liquid has been allowed to enter the monitor voids the warranty.

CAUTION! Unplug the sensor from the monitor before cleaning or disinfecting.

NOTE! Obstructions or dirt on the sensor's red light or detector may cause a sensor failure. Make sure there are not obstructions and the sensor is clean.

3. Check the sensor to make sure it do not appear damaged.

WARNING! Using a damaged sensor may cause inaccurate readings, possibly resulting in patient injury or death. Inspect each sensor. If a sensor appears damaged, do not use it. Use another sensor or contact your authorized repair center for help.

WARNING! Using a damaged patient cable may cause inaccurate readings, possibly resulting in patient injury or death. Inspect the patient cable. If the patient cable appears damaged, do not use it. Contact your authorized repair center for help.

WARNING! If any of the integrity checks fail, do not attempt to monitor the patient. Use another sensor or patient cable, or contact the equipment dealer for help if necessary.

4. Hold the connector rather than the cable when connecting or disconnecting the sensor to the device and push the connector firmly into the receptacle.

•The monitor will automatically detect when the SpO2 patient cable is connected and the oximetry parameter will be active.

5. Attach the sensor to the patient.

a) Make sure the red light in the sensor is illuminated.

b) Select the appropriate sensor size.

8.5 Performance Considerations

WARNING! Pulse oximetery readings and pulse signal can be affected by certain ambient environmental conditions, sensor application errors, and certain patient conditions.

NOTE! A Patient Simulator does not calibrate the oximeter. The oximeter does not require calibration. A Patient Simulator provides a known SpO_2 value and pulse rate to the oximeter that allows the oximeter's performance to be checked.

Inaccurate measurements can be caused by:

- Incorrect application of the sensor
- Placement of the sensor on an extremity with a blood pressure cuff, arterial catheter, or intravascular line
- Ambient light
- Prolonged patient movement

Loss-of-pulse signal can occur for the following reasons:

- The sensor is too tight
- A blood pressure cuff is inflated on the same extremity as the one with the sensor attached
- There is arterial occlusion proximal to the sensor

Select an appropriate sensor, apply it as directed, and observe all warnings and Cautions presented in the directions for use accompanying the sensor. Clean and remove any substance such as nail polish from the application site. Periodically check to ensure that the sensor remains properly positioned on the patient.

WARNING! Tissue damage can be caused by incorrect application or duration of use of a SpO_2 sensor. Inspect the sensor site as

directed in the sensor directions for use.

High ambient light source such as surgical lights (especially those with a xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps, and direct sunlight can interfere with the performance of a SpO_2 sensor. To prevent interference form ambient light, ensure that the sensor is properly applied, and cover the sensor site with opaque material.

NOTE! Failure to take this precaution in high ambient light conditions may result in inaccurate measurements.

If patient's movement presents a problem, try one or more of the following remedies to correct the problem:

- Verify that the sensor is properly and securely applied
- Move the sensor to a less active site
- Use an adhesive sensor that tolerates some patient motion
- Use a sensor with fresh adhesive backing

8.6 Choosing the Waveform Settings

Use the pleth menu options to adjust the speed of the SpO_2 waveform, or plethysmogram.

8.6.1 Access the Waveform Menu

The pleth menu is accessible from the pleth waveform channel.

To access the pleth menu from the waveform channel:

• Push and turn the rotary knob on the monitor to move the cursor. Highlight the pleth waveform channel and push the knob to select. The pleth menu will appear in the middle of the display.

8.6.2 Fill the Pleth Waveform

You can choose to fill the pleth or not.

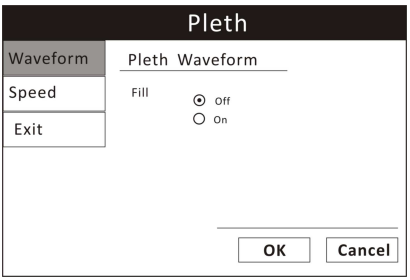

Figure 8.2: Fill Pleth Waveform

To fill the pleth or not:

1. On the pleth menu, highlight WAVEFROM and push the knob to select.

2. Highlight the desired option (On/ Off)and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

8.6.3 Choose the Waveform Speed

You can choose the speed at which the Pleth is displayed.

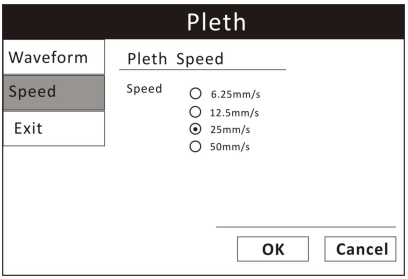

Figure 8.3: Choose the Pleth Waveform Speed

To change the speed of the pleth:

1. On the pleth menu, highlight SPEED and push the knob to select.

2. Highlight the desired size of the waveform (6.25, 12.5, 25, or 50 mm/second) and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

NOTE ! The ECG waveform speed will be changed corresponding with the pleth speed.

8.7 Adjusting the Settings in the Parameter Box

8.7.1 SpO_2 Alarm Setup

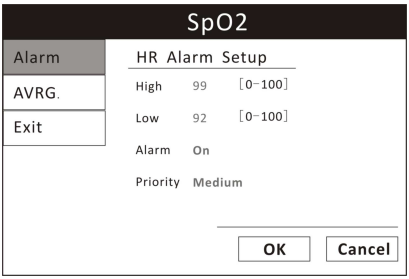

Figure 8.4: SpO_2 Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for the oxygen saturation value. If SpO2 ALARM is on, an alarm will be issued when the high or low alarm limit is violated. If you turn SpO2 ALARM off and the high or low alarm limit is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, SpO2 ALARM will be reset to ON; the default setting is ON.

To turn on or off the SpO_2 alarm detection:

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the SpO_2 parameter box and push the knob to access the SpO_2 parameter menu.

b) Highlight ALARM and push the knob to select.

c) Choose ON or OFF and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the SpO_2 parameter box and push the knob to access the SpO_2 parameter menu.

b) Highlight ALARM and push the knob to select.

c) Move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to "OK" or "Cancel" to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the SpO_2 parameter box and push the knob to access the SpO_2 parameter menu.

b) Highlight SpO_2 ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to "OK" or "Cancel" to save or delete your settings.

8.7.2 Choose the Averaging Period for the Oximetry Parameter

NOTE! SpO_2 averaging to the number of pulse beats over which the SpO_2 value is averaged; pulse averaging is the number of seconds over which the pulse value is averaged.

The measured values for oximetry (%SpO_2 and PR) can be determined by averaging the sensor readings over a selected number of beats or seconds. For example, if you choose 16 Beats, the measured value displayed for oxygen saturation (%SpO_2) will be the average of the oxygen saturation readings over sixteen pulse beats; the measured value displayed for pulse rate (PR) will be the average of the number of pulse beats over sixteen seconds.

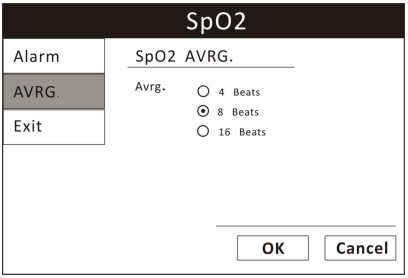

Figure 8.5: Choose SpO_2 Average Period

To choose the averaging period:

1. Highlight AVRG. and push the knob to select.

2. Choose the desired averaging period (4 beats, 8 beats, 16 beats) and push the knob to select.

AVERAGING PERIOD FOR %SPO2 READINGS	AVERAGING PERIOD FOR PR READINGS
4 beats	4 seconds
8 beats	8 seconds
16 beats	16 seconds

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

Chapter 9: Non-invasive Blood Pressure

9.1 Non-invasive Blood Pressure Measurement Capability

The non-invasive blood pressure (NIBP) parameter provides systolic, diastolic, and mean arterial blood pressure values. The measured values for non-invasive blood pressure (SYS, DIA, and MAP) are displayed in the NIBP parameter box. The measured values will be saved every 10 seconds. NIBP measurements can be made in automatic, manual, or STAT modes.

9.2 Non-invasive Blood Pressure Warnings, Cautions, and Notes

WARNING! Blood pressure measurements may be inaccurate if cuffs and/or hoses other than those specified by Utech Co., Ltd. are used.

WARNING! Verify cuff size is correct for the selected patient mode on the monitor.

WARNING! Repeated use of STAT mode for periods longer than 15 minutes should be avoided to reduce the patient's risk for soft tissue or nerve damage. When using the monitor for long periods of time, select the longest clinically appropriate measurement interval and periodically examine the patient for signs of injury and ensure proper cuff placement.

WARNING! Make sure that hoses are not kinked, compressed, or restricted.

WARNING! Check that operation of the equipment does not impair the circulation of the monitored patient.

WARNING! Blood pressure measurements may not be accurate for patients experiencing arrhythmias.

WARNING! Do not verify the Non-Invasive Blood Pressure calibration while the cuff is attached to a patient.

CAUTION! Extremity and cuff motion should be minimized during blood pressure determinations.

CAUTION! Proper blood pressure cuff size and placement are essential to the accuracy of the blood pressure determination.

CAUTION! Any blood pressure recording can be affected by the position of the patient, his or her physiologic condition, and other factors.

CAUTION! Blood pressure measurements should be interpreted by a physician.

NOTE! There are no user-serviceable adjustments for the Non-Invasive Blood Pressure calibration verification. If the monitor appears to be out of calibration, contact your authorized repair center for help.

NOTE! Systolic and diastolic blood pressure measurements determined with this device are equivalent to those obtained by the trained observer using the cuff/stethoscope auscultation method, within the limits prescribed by the Chinese National Standard, Electronic or Automated Sphygmomanometers.

NOTE! Mean arterial blood pressure measurements determined with this device are equivalent to those obtained by an intra-arterial blood pressure measurement device as determined by Utech Co., Ltd.

9.3 NIBP Theory of Operation

The Vital Signs Monitor uses oscillometric principles to calculate the systolic, diastolic and mean arterial pressure values from the blood pressure cuff. When the blood pressure cuff is inflated it creates an occlusion of the artery on the limb being used. The cuff is then deflated by a set amount of pressure in the cuff. When an oscillometric pulse is identified, another similar pulse must also be identified and measured before it steps down again. This method of measuring blood pressure ensures the measurement is a true measurement and not a change in the cuff due to motion. If the measurement is not reproduced a second time, it is not recorded and the pressure is stepped down. Once two identical oscillations are obtained the cuff deflates. In other words, it will only capture readings that are reproduced; if there are no similar oscillations at that pressure, the reading is discarded as artifact. This type of oscillometric technology is more motion tolerant and generally produces a higher success rate than other NIBP technologies.

9.4 Measurement Limitations

Measurements are impossible with heart rate extremes of less than 40 bpm or greater than 300 bpm, or if the patient is on a heart-lung machine.

The measurement may be inaccurate or impossible:

• if a regular arterial pressure pulse is hard to detect

• with cardiac arrhythmias

• with excessive and continuous patient movement such as shivering or convulsions

• with rapid blood pressure changes

• with severe shock or hypothermia that reduces blood flow to the peripheries

• with obesity, where a thick layer of fat surrounding a limb dampens the oscillations coming from the artery

• on an edematous extremity.

9.5 Attaching the Patient

1. Choose a blood pressure cuff appropriate for the patient and the limb size by measuring the circumference of the limb. See the table below.

WARNING! Blood pressure measurements may be inaccurate if cuffs and/or hoses other than those specified by Utech Co., Ltd. are used.

NOTE! The NIBP Cuff Kit is latex-free.

LIMB CIRCUMFERENCE	CUFF
3-9cm	Extra small
5-15cm	Small
9-25cm	Medium
17-41cm	Large

CAUTION! Extremity and cuff motion should be minimized during blood pressure determinations.

CAUTION! Proper blood pressure cuff size and placement are essential to the accuracy of the blood pressure determination.

CAUTION! Any blood pressure recording can be affected by the position of the patient, his or her physiologic condition, and other factors.

WARNING! Verify cuff size is correct for the selected patient mode on the monitor.

2. Attach the cuff to the patient.

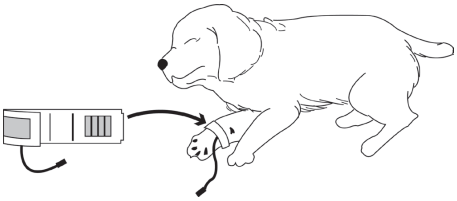

Figure 9.1: Attach NIBP Cuff

a) Squeeze all the air out of the cuff.

b) Place the cuff on a limb at the same level as the heart. The cuff logo should be facing up, away from the patient. The width of the cuff should be approximately 30-60% of the circumference of the limb. You do not need to align the cuff along an artery.

c) Wrap the cuff around the limb and secure the Hook & Loop closure.

CAUTION ! The limb used for measurement should be at the same level with the heart. If this can not be achieved, use the following correction methods:

■ If the blood pressure cuff is above the heart level, add 0.9mmHg (0.10kPa) to the displayed value per centimeter, or 2.2mmHg (0.25kPa) per inch.

■ If the blood pressure cuff is below the heart level, subtract 0.9mmHg (0.10kPa) from the displayed value per centimeter, or 2.2mmHg (0.25kPa) per inch.

■ If there are doubts regarding the accuracy of the reading, check the patient's vital signs using other means before checking the functions of the monitor.

3. Connect the NIBP supply hose to the monitor.

WARNING! Make sure that hoses are not kinked, compressed, or restricted.

4. Connect the cuff to the supply hose.

The NIBP parameter box is always displayed; measured values will appear as soon as a blood pressure measurement is taken.

5. Be sure the patient type (Cat, dog, or horse) is appropriate for the patient.

6. If necessary, add the patient information to the monitor.

7. Choose the NIBP mode (AUTO, MANUAL, or STAT) that is appropriate for the patient.

•Non-invasive blood pressure (NIBP) measurements can be made in automatic, manual, or STAT modes. In the automatic mode, the monitor will measure the patient's NIBP periodically, according to the interval you select using the parameter box menu. In the manual mode, the monitor will measure the patient's NIBP only when you press the NIBP key. In the STAT mode, the monitor will measure the patient's NIBP continuously for five minutes. The default setting for NIBP mode is MANUAL.

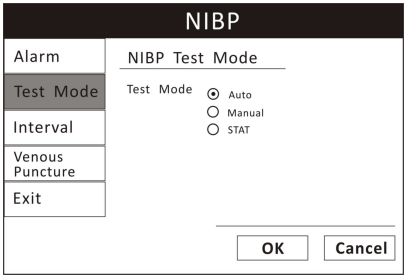

Figure 9.2: Choose NIBP Mode

To change the NIBP mode:

1. Push and turn the rotary knob on the monitor to move the cursor. Highlight NIBP parameter box and push the knob to select.

2. Turn the rotary knob to choose a test mode (AUTO, MANUAL, or STAT), and push the knob to select.

•If you choose AUTO or STAT, the selected mode will be displayed in the parameter box.

9.6 Adjusting the Settings in the Parameter Box

9.6.1 NIBP Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for each of the NIBP measured values (SYS, DIA, and MAP). If SYS ALARMS is on, an alarm will be issued when the high or low alarm limit for systolic pressure is violated, regardless of which set of alarm limits is displayed. If you turn SYS ALARMS off and the high or low alarm limit is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, [SYS, DIA, or MAP] ALARMS will be reset to ON; the default setting for each pressure value is ON.

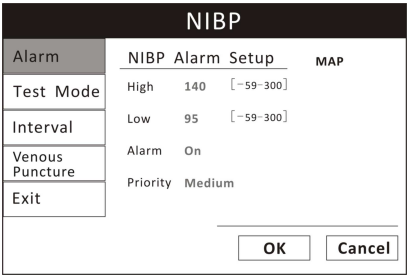

Figure 9.3: NIBP Alarm Setup

To turn on or off the alarm detection for each pressure value (SYS, DIA and MAP):

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the NIBP parameter box and push the knob to access the NIBP parameter menu.

b) Highlight NIBP ALARM and push the knob to access the alarms submenu.

c) Choose each pressure value (SYS, DIA, and MAP) and choose ON or OFF for each one. Push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

The alarm limits displayed in the parameter box are the high and low alarm limits for SYS and DIA.

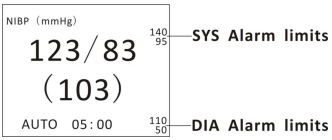

Figure 9.4: SYS and DIA Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the NIBP parameter box and push the knob to access the NIBP parameter menu.

b) Highlight ALARM and push the knob to select.

c) Choose each pressure value (SYS, DIA, and MAP) and move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the NIBP parameter box and push the knob to access the NIBP parameter menu.

b) Highlight ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

9.6.2 Choose the Interval for Automatic NIBP Measurements

If you selected the automatic mode (AUTO) for NIBP measurements (instead of MANUAL or STAT), the monitor will measure the patient's NIBP periodically,

according to the interval you select (2, 3, 5, 10, or 30 minutes, or 1, 2 hours). The time remaining until the next measurement will be displayed in the parameter box.

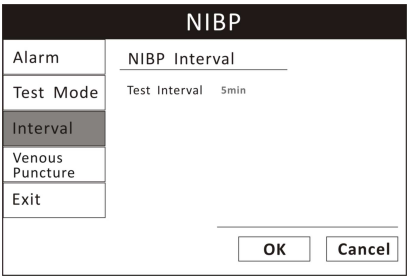

Figure 9.5: Choose NIBP Interval

To choose the automatic NIBP measurement interval:

1. Be sure the NIBP MODE is set to AUTO.

2. On the NIBP parameter menu, highlight INTERVAL and push the knob to select.

3. Highlight the desired interval (2, 3, 5, 10, or 30 minutes, or 1, 2 hours) and push the knob to select.

4. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

9.6.3 Assist Venous Puncture

You can use the NIBP cuff to cause sub-diastolic pressure. The cuff deflates automatically after a set time if you do not deflate it.

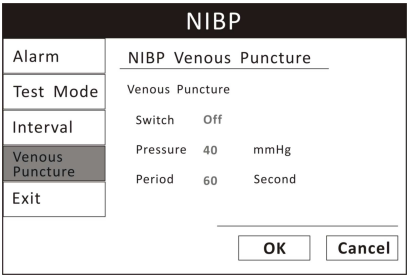

Figure 9.6: Venous Puncture

1. In the NIBP parameter menu select Venous Puncture.

2. Puncture vein and draw blood sample.

3. Reselect Venous Puncture to deflate the cuff.

During measurement, the NBP display shows the inflation pressure of the cuff and the remaining time in venous puncture mode.

9.7 Measuring Non-invasive Blood Pressure (NIBP)

9.7.1 Manual NIBP Mode

If you selected MANUAL as the NIBP mode, press the NIBP key on the monitor.

If the measurement is successful, you will see the systolic, diastolic, and mean arterial pressure values displayed in the NIBP parameter box.

If the measurement is not successful, you will see dashes (- - -) displayed in the place of the pressure values. You will see a message displayed in the NIBP parameter box.

9.7.2 Auto NIBP Mode

If you selected AUTO as the NIBP MODE, the first measurement will begin after the interval time has elapsed.

If the measurement is successful, you will see the systolic, diastolic, and mean arterial pressure values displayed in the NIBP parameter box. The automatic measurement interval will be reset, and another measurement will begin as soon as the interval time has elapsed.

If the measurement is not successful, you will see dashes (- - -) displayed in the place of the pressure values. You will see a message displayed in the NIBP parameter box. The automatic measurement interval will be reset.

9.7.3 STAT NIBP Mode

If you selected STAT as the NIBP MODE, the first measurement will begin immediately and a five-minute timer is started. NIBP measurements are taken repeatedly until the five minutes have elapsed.

If the measurement is successful, you will see the systolic, diastolic, and mean arterial pressure values displayed in the NIBP parameter box and you will hear the completion beep. The time of the successful reading will also be displayed in the parameter box. When the five minutes have passed or if you press NIBP key to cancel, the mode will automatically return to the previous setting (MANUAL or AUTO).

If the measurement is not successful, you will see dashes (- - -) displayed in the place of the pressure values. You will see a message displayed in the NIBP parameter box. NIBP readings will not continue until the error message is acknowledged, but the five-minute timer will continue to run.

9.7.4 Canceling the an NIBP Measurement

Regardless the selected mode (AUTO, MANUAL, or STAT), you can stop a measurement in progress by pressing the NIBP key on the monitor.

If the monitor is in automatic (AUTO) mode, another measurement will start after the selected interval has elapsed.

If the monitor is in STAT mode and you press the NIBP key to cancel the measurement, the mode will automatically return to the previous setting (MANUAL or AUTO).

9.8 Cleaning the NIBP Cuff

1. Place the Cuff Cap on the end of the cuff hose.

NOTE! Failure to place the cuff cap on the hose will allow water to enter the bladder. This will cause the cuff to malfunction and will damage the monitor.

2. Pre-clean the cuff by removing contaminate material, hair, and debris.

3. Wash the cuff in a regular load of laundry, or hand-wash.

4. Allow the cuff to air-dry.

CAUTION! Do not place the cuff in the dryer.

Chapter 10: Respiration Rate (Resp)

10.1 Respiration Rate Measurement Capability

The RESP parameter provides respiration rate (RPM) values. The measured value for RESP is displayed in the RR parameter box.

For the respiratory measurement (Resp), the monitor measures the thoracic impedance between two ECG electrodes on the patient's chest. Changes in the impedance due to thoracic movement produce the Resp waveform on the monitor screen. The monitor counts the waveform cycles to calculate the respiration rate (RR).

10.2 Respiration Rate Warnings, Cautions, and Notes

WARNING! Respiration monitoring is not recommended on active patients. It may lead to false alarm.

WARNING! Install white and red electrodes in opposite positions to obtain optimum respiration waveform. Avoid placing the cable above liver and ventricle to reduce false readings produced by the heart coverage or pulsation blood flow. This is very important for neonates.

10.3 Attaching to the Patient

Correct patient skin preparation techniques for electrode placement are important for Resp measurement: you will find this information in the chapter on ECG.

The Resp measurement uses the standard ECG cable sets and lead placements. You can use any of the different types of ECG cable sets to measure Resp, as long as you use ICU ECG cables.

The Resp signal is always measured between two of the ECG electrodes. If you are using standard ECG electrode placement, Resp is measured between the RA and LL electrodes.

10.4 Choosing the Waveform Settings

10.4.1 Change the ECG Lead

You can choose one of the ECG lead as a source to measure the RR from lead I, II, III. The selected lead will be displayed in the waveform channel.

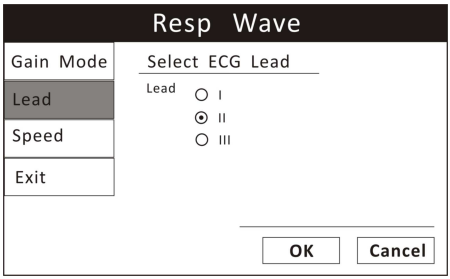

Figure 10.1: Select ECG Lead

To change the ECG lead:

1. On the RESP waveform menu, highlight LEAD and push the knob to access the submenu.

2. Highlight the desired ECG lead and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

10.4.2 Choose the Waveform Size

If any of the displayed RESP waves is too small or clipped, you can change the size of the RESP waveforms on the display. The selected size (X1/2, X1, X2, or X4) will appear in the waveform channel. The default size is times one (X1).

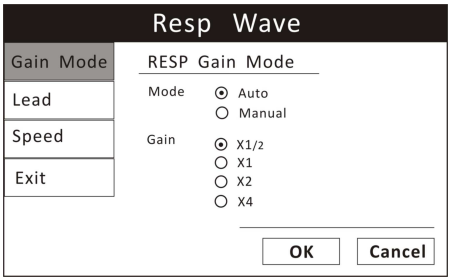

Figure 10.2: Choose RESP Waveform Size

To change the size of the RESP waveform:

1. On the RESP waveform menu, highlight Gain Mode and push the knob to select.

2. Highlight the desired size of the waveform (X1/2, X1, X2, or X4) and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

10.4.3 Choose the Waveform Speed

You can choose the speed at which the RESP waveform is updated.

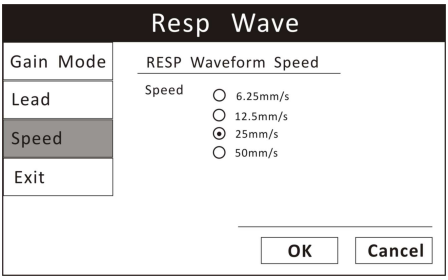

Figure 10.3: Choose RESP Waveform Speed

To change the speed of the RESP Waveform:

1. On the RESP Wave menu, highlight SPEED and push the knob to select.

2. Highlight the desired size of the waveform (6.25, 12.5, 25, or 50 mm/second) and push the knob to select.

3. Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

10.5 Adjusting the Settings in the Parameter Box

10.5.1 RR Alarm Setup

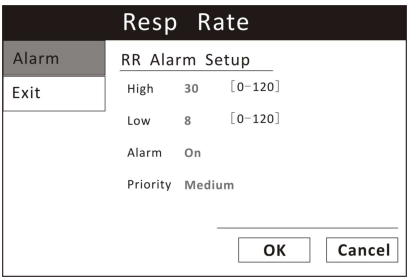

Figure 10.4: RR Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for the Resp rate value. If RR ALARMS is on, an alarm will be issued when the high or low alarm limit is violated. If you turn RR ALARMS off and the high or low alarm limit is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, RR ALARMS will be reset to ON; the default setting is ON.

To turn on or off the Resp rate alarm detection:

a) Push and turn the rotary knob on the monitor to move the cursor. Highlight the HR parameter box and push the knob to access the RR parameter menu.

b) Highlight RR ALARM and push the knob to select.

c) Choose ON or OFF and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the RR parameter box and push the knob to access the RR parameter menu.

b) Highlight RR ALARM and push the knob to select.

c) Move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the RR parameter box and push the knob to access the RR parameter menu.

b) Highlight RR ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

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Chapter 11: Temperature

11.1 Temperature Measurement Capability

Two independent channels of temperature (T1 and T2) monitoring are available. Each channel is compatible with Smiths Medical PM, Inc. YSI 400-series disposable temperature sensors, or equivalent. The measured value for each temperature channel (T1 and T2) is displayed in the TEMP parameter box. If the temperature channel is turned on and no measured value is available, dashes (- - -.-) will be displayed in the parameter box.

11.2 Temperature Warnings, Cautions, and Notes

WARNING! Before monitoring starts, check if the sensor cable is properly connected. Pull the temperature sensor cable from the channel 1 jack, an error message "T1 sensor is off" is displayed on the screen and the alarm sound can be heard. The same happens with the other channel.

WARNING! Be cautious when handling temperature sensors and cables. When it is not in use, the sensor and cable ought to be in a loose loop. Tightly folded cable can cause mechanical damage.

WARNING! Temperature calibration should be done once a year (or according to the schedule specified in the hospital procedure). If calibration is needed, contact the manufacturer.

WARNING! Disposable temperature sensors should only be used once.

WARNING! During monitoring process, the temperature measurement instrument will conduct a self-check every hour lasting for two seconds. This will not affect normal operation of the monitor.

NOTE! Use only temperature sensors and interface cables specifically intended for use with this device.

11.3 Attaching the Patient

1. Choose a temperature sensor. Each temperature channel is compatible with Utech Co., Ltd. YSI 400-series disposable temperature sensors, or equivalent.

2. Apply the temperature sensor to the patient according to the standards of practice and care for your facility, and according to the temperature sensor manufacturer's instructions.

3. If applicable, connect the temperature sensor to the interface cable.

4. Connect the interface cable and the temperature sensor to the T1 or T2 receptacle on the side of the monitor.

The monitor will automatically detect when the interface cable and temperature sensor are connected.

The temperature parameter will be active and measured values for temperature will be displayed in the TEMP parameter box.

11.4 Adjusting the Settings in the Parameter Box

11.4.1 TEMP Alarm Setup

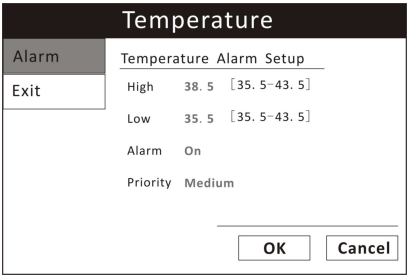

Figure 11-1: TEMP Alarm Setup

1. Turn Alarm Detection On or Off

You can turn on or off the alarm detection capability for temperature value. If ALARMS is on, an alarm will be issued when the high or low alarm limit for either channel 1 or 2 is violated. If you turn ALARMS off and the high or low alarm limit for either channel 1 or 2 is violated, an alarm will not be issued. When you turn off the monitor and turn it on again, the ALARMS will be reset to ON; the default setting for each is ON.

To turn on or off the TEMP alarm detection:

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the TEMP parameter box and push the knob to access the TEMP parameter menu.

b) Highlight ALARM and push the knob to select.

c) Choose ON or OFF and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

2. Set High and Low Alarm Limits

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the TEMP parameter box and push the knob to access the TEMP parameter menu.

b) Highlight ALARM and push the knob to select.

c) Move the cursor to High/Low and push the knob to select.

d) Turn the knob to increase or decrease the number and push it to confirm.

e) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

3. Choose Alarm Priority

a) Push and Turn the rotary knob on the monitor to move the cursor. Highlight the TEMP parameter box and push the knob to access the TEMP parameter menu.

b) Highlight TEMP ALARM and push the knob to select.

c) Choose Senior, Junior or Medium and push the knob to select.

d) Turn the rotary knob to “OK” or “Cancel” to save or delete your settings.

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Chapter 12: Drug Calculator

Drug mixtures for intravenous (IV) drug infusions combine information on drug dose, rate, amount, volume, concentration, and standardized rate. The Drug Calculator helps you to manage infusions by calculating one of these values at a time.

Caution! Before you administer any drug, always check that the correct calculation units and patient category selected. Consult your pharmacy if you have questions.

Caution! Decisions on the choice and dosage of drugs administered to patients must always be made by the physician in charge. The Drug Calculator performs calculations based on the values input during use, it does not check the plausibility of the calculations performed.

12.1 Accessing the Drug Calculator

To access the Drug Calculator, Press the Main Menu key and turn the rotary knob on the monitor to choose the Tools and push the knob to select. And then move the knob to highlight the Drug Calculator.

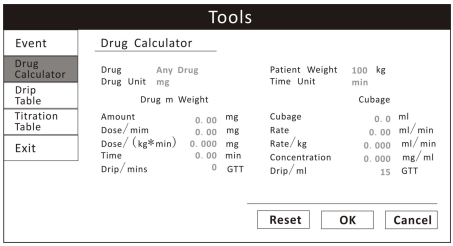

Figure12.1 Drug Calculator

12.2 Measurement Units

Drug units

When the drug name is “any drug”, you can select: g, mg, mcg, unit, k unit, m unit, mEq.

Once the drug name is identified, the unit is set by the drug calculator automatically. The user cannot modify it.

After the drug measurement unit is set, the drug weight and concentration units in the drug calculator adjust accordingly.

Time units

Min (minute) and hr (hour) are used as time units. After setting the time unit, the dosage rate and infusion rate units in the drug calculator adjust accordingly.

12.3 Glossary

Drug weight: The total weight of the drug used by a patient within a certain time period.

Volume: The liquid volume of the solution including the drug.

Dose/min or **Dose/hr**: The drug quantity injected into a patient within a unit of time (per minute/hour).

Dose/(kg*min) or **Dose/(kg*hr)**: The amount of drug per 1kg of a patient's weight injected in the patient within the unit time period (per minute or hour)

Dose/(kg*min)*Patient Weight＝Dose/min
Dose/(kg*hr)*Patient Weight＝Dose/hr

Infusion **Rate**: The volume of the drug solution injected into a patient's body within a unit of time (per minute, hour). The unit is ml/min or ml/hr.

Infusion **Rate/kg**: The volume of the drug solution per 1kg of a patient's weight injected into the patient within unit time (per minute, hour), the unit is ml/min or ml/hr.

Infusion Rate/kg*Patient Weight＝Infusion Rate

Time: The consumed time for drug infusion (the unit is min, hr).

Concentration: The concentration of the drug in the solution.

Concentration＝Total Drug/Liquid Volume of Solution

Drip/min, **Drip/hr**: The number of drops (guttae) per unit time (min/hr)

dropped form the infusion device. The unit is GTT.

Drip/ml: The number of drops (guttae) per unit volume (ml) dropped form the infusion device. The unit is GTT.

12.4 Performing Drug Calculation

A list of drugs can be configured for the monitor containing predefined dosage recommendations and unit settings. Contact your pharmacist if you have any questions about the drugs in the list.

a) Entering numbers

To enter numbers, turn the rotary knob to move the cursor. Highlight the desired values and push the knob to select. Choose each digit and push rotary knob to enter the digit selection status.

The selection range for each digit is 0 - 9.

When the digit is larger than the display value, it displays “---.--". When it is smaller than the display value, it displays “0.00”.

b) Calculation rules

The equation for drug volume:

Total Drug = Dose/min* Duration
Dose/min = Dose/(kg*min)*Patient Weight

The equation for solution volume

Liquid Volume = Infusion Rate * Duration
Infusion Rate = Infusion Rate / kg * Patient Weight

Concentration = Total Drug / Liquid Solution Volume

c) Known value and calculation results

- Total drug, dosage/min, dosage/ (kg*min), volume, infusion speed, infusion speed/kg, time, concentration can be entered as known items or be put out as a calculation result.

- The user can enter at least three known items according to the calculation requirements. The drug calculator will automatically calculate using the default equations.

- All fields are initially displayed as 0.00 and can be filled with value. After the user inputs the known item, the drug calculator will begin calculating and the result will be displayed in real time. The calculation result is then locked. The user can only modify the entered value. To put in 0.00 will cancel the entry.

- Pressing the Reset button will return user to the initial status of the entry.

d) Performing calculations for a non-specific drug

- When the drug selection is any drug, the drug calculator only provides the calculation for the infusion liquid. No application range is prompted for the dose or concentration.

- Enter three values: patient weight, drug unit, time unit.

- Enter the drug information into corresponding fields, press OK button and the drug calculator automatically calculates relevant value.

e) Performing calculation for a specific drug

- The drug calculator has been preset to do calculations for more than ten types of general drugs, e.g. Aminophylline and Amrinone Lactate (see Drug Dosage Range Limitation Table). Once a drug name is selected, the drug's relevant value such as concentration, total drug amount, dosage/min will have corresponding limitation ranges. When any information entered or any calculation result is out of range, the drug calculator will show it in red color.

- The drug dosage over range prompted from the drug calculator can only warn the user to pay attention to apply appropriate dosage of the current drug. The final infusion dosage and infusion process should be determined by the physician in charge.

Drug Dosage Range Limitation Table

Drug name	Concentration	Speed	Dosage
Aminophylline	0.5~1mg/ml	<25mg/min	250~500mg

Amrinone Lactate	1~3mg/ml	5~10ug/kg/min	5 ~10mg/kg
Bretylium Tosilate	10mg/ml	1~50mg/min	5~10mg
Dobutamine	0.5~5mg/ml	2.5~40ug/kg/min	250mg
Dopamine	<3.2mg/ml	1~30ug/kg/min	10~20mg
Epinephrine	<64ug/ml	1~4ug/min	0.025~1mg
Heparin Sodium	20~40U/ml	15~20U/kg/h±10%	6000~20000U
Isuprel	2~4ug/ml	2~20ug/min	0.5~1mg
Lidocaine	<8mg/ml	1~4mg/min	1~2mg/kg
Morphine hydrochloride	0.5~5mg/ml	<2mg/min	5~15mg
Nitroprusside	0.1~1mg/ml	0.5~10ug/kg/min	50mg

12.5 Charting Infusion Progress

The Drip Table shows you at a glance how much of the infusion has been administered to your patient and how much time is left.

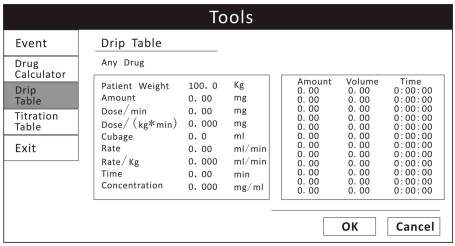

Figure 12.2: Drip Table

- The titration process table displays the remaining amount of the drug and liquid at each time frame after the user inputs the data into the drug calculator.

- Select “titration process table” to enter this function.

- The left side of the screen shows the data (and calculation result) entered by the user. The right side is equally divided into 15 segments, according to the total infusion process, listing the total drug amount and liquid volume for each segment.

- All the fields in this window can not be modified.

- The unit for the total drug amount is the same as the unit entered at the drug calculator main window. The liquid volume unit is ml.

●Press “OK” to exit the table and return to the drug calculator main widow.

12.6 Using the Titration Table

Use the Titration Table to see at a glance what dose your patient would receive of a drug at different infusion rates.

The higher the infusion rate entered, the bigger the steps between table entries.

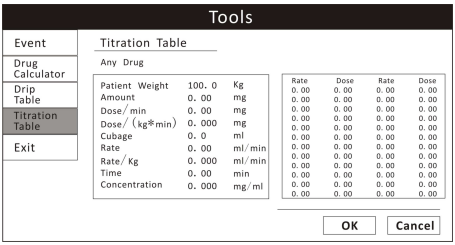

Figure 12.3: Titration Table

- Select the “titration table” to enter this function.
- The left side of the screen shows the data (and calculation result) entered by the user. The right side is equally divided into 30 segments showing the relationship between the dosage/min and infusion speed.
- There are two fields in the list: dosage/min (in the case where the unit selected is hr, then this field will be dosage/hr) and infusion speed.
- The range used in calculating the dose/min (dose/hr) is one to two times of the value entered by the user in the drug calculator at the beginning.
- Press OK to return to the drug calculator screen.

12.7 Recalculation

The drug calculator result remains in the monitor when the user exits this function or turns off the monitor. When the user enters the drug calculator function again, the latest data appears. If the user wants to start a new calculation, press “Reset” in the drug calculator screen which clears all existing data and starts a new calculation.

Chapter 13: Maintenance and Troubleshooting

The products have been designed to operate continuously for long periods without maintenance.

However, in order to ensure a continued high level of performance and safety of operation, you must observe the routine maintenance information in this section.

Perform on-site routine maintenance daily; a summarized schedule and full details are contained in this section.

The Vital Signs Monitor Service Manual also contains the circuit diagrams, parts lists, and descriptions required for carrying out repairs and disposing of batteries. The Service Manual is available on request from Utech Co., Ltd. or your local agent.

MAINTENANCE ITEM	RECOMMENDED	MAINTENANCE INTERVAL
Monitor surfaces	Clean and/or disinfect	As required (See this page for instructions)
ECG cables	Clean and/or disinfect Inspect for signs of damage or deterioration; replace as required.	Daily Daily
ECG electrodes	Clean and/or disinfect	When attaching a new patient
SpO2 sensor	Clean and/or disinfect	When attaching a new patient
NIBP cuff and hose	Clean and/or disinfect Inspect for signs of damage or deterioration; replace as required.	When attaching a new patient Daily
TEMP sensor	Clean and/or disinfect	When attaching a new patient

CAUTION! Follow local governing ordinances and recycling instructions regarding disposal and recycling of device components.

13.1 Cleaning the Monitor's Surfaces

WARNING! Do not autoclave, ethylene oxide sterilize, or immerse the monitor in liquid.

CAUTION! Do not allow water or any other liquid to be spilled onto the monitor. Unplug the AC power cord from the monitor before cleaning or disinfecting.

CAUTION! Where the equipment has accidentally gotten wet, it should be wiped dry externally and allowed to dry thoroughly before use.

NOTE! Use only a soft cotton cloth, or a cloth specifically designed for cleaning LCD displays, to clean the monitor's screen. Do not clean the screen with tissues, paper towels, or any other paper-based wipe. Paper-based wipes can scratch the screen.

NOTE! Do not clean the screen with isopropyl alcohol or glutaraldehyde. These liquids can scratch the screen. Use only water or a mild soap solution to clean the screen.

Clean the surfaces of the monitor with a soft cloth moistened in water or a mild soap solution. If disinfecting is necessary, wipe the surfaces of the monitor (but not the screen) with isopropyl alcohol or glutaraldehyde. Then wipe the surfaces with a soft, water-moistened cloth.

13.2 Long-term Storage

If the monitor will be stored for a long period of time, pack the monitor and its accessories in the original packing materials and shipping carton. The long-term storage facility should meet these requirements:

- Indoor
- From -40 to 75 °C (-40 to 167 °F)
- Relative humidity from 10-95% (non-condensing)
- No periodic inspection required

13.3 Operator's Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
The AC power LED on the front of the	The AC power cord is not connected to the monitor, the AC line, or both.	Connect the AC power cord to the monitor and to the AC line.

monitor is not lit.	The AC power cord is connected to a wall outlet that is controlled by a wall switch. The AC line fuse has blown.	Only connect the AC power cord to an outlet that is not controlled by a wall switch. Contact your authorized repair center.
Battery run time is excessively short on a fully charged battery	The battery is spent.	Contact your authorized repair center.
The display on the monitor does light.	The display backlight is defective.	Contact the service department.
SENSOR OFF is displayed in the Pleth waveform channel	The SpO2 sensor is improperly positioned on the patient. You are using the improper SpO2 sensor for the application. Either the SpO2 sensor is defective.	Reposition the sensor on the patient. Change the sensor or contact the manufacturer service department. Change the sensor or contact the manufacturer service department.
Pulse rate is erratic, intermittent, or incorrect.	The SpO_2 sensor is improperly positioned on the patient. The patient is experiencing poor perfusion. The patient is moving too much. There is too much ambient light around the SpO_2 sensor.	Reposition the sensor on the patient. Reposition the sensor on the patient. Make sure that the patient remains still. Shield the SpO_2 sensor with a towel.
There is no peripheral pulse registering on the bargraph in the SpO_2 parameter box.	The SpO2 sensor is not connected to the monitor or to the patient.	Connect the sensor to the extension cable and connect the extension cable to the monitor.

	The SpO_2 sensor is improperly positioned on the patient. The patient is experiencing poor perfusion. Either the SpO_2 sensor or the extension cable is defective.	Reposition the sensor on the patient. Reposition the sensor on the patient. Change the sensor or contact the manufacturer service department.
LEADS FAIL is displayed in the ECG waveform channel.	One or more of the ECG leads is not connected to the electrode. One of the ECG leads is broken, creating high impedance. The electrode's impedance is too high.	Connect the ECG lead to the electrode. Replace the ECG leads. Reapply the electrodes.

13.4 Maintenance Menu

13.4.1 Access the Maintenance Menu

Press the menu key to pop up the main menu and turn the rotary knob on the monitor to move the cursor to the "Maintenance" option. Then press the rotary knob to enter its submenu.

OPTIONS	INSTRUCTION
Machine	Back to factory default settings and use the DEMO mode.
Login	These three menus are password protected and contains "System configure" and the calibration of ECG, NIBP and TEMP which only open to dealer and producer.
Config	
Calibrate	

13.4.2 Back to Factory Default Values

You can set up your monitor to operate using the default values you choose for alarm limits, volume, LCD brightness, parameter settings.

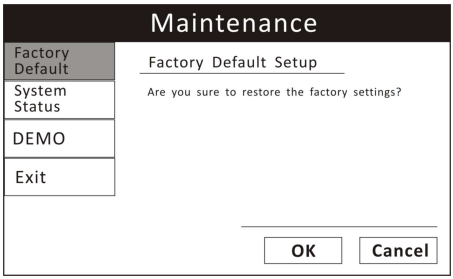

Figure 13.1: Factory Default Values

1. Press the menu key to pop up the main menu and turn the rotary knob to move the cursor to the “Maintenance” option.

2. Push the rotary knob to access the “Maintenance” submenu and choose “Machine” option. Turn the knob to highlight the “Factory Default” option.

3. Push the rotary knob to access the factory default submenu and turn the knob to “OK” and push it if you want to restore the factory settings.

13.4.3 Using the Demo Mode

This demo mode is intended for service personnel. Contact your authorized repair center for help.

WARNING! While the demo mode is active, no patient data is collected or analyzed. Never attach a patient to the monitor while it is in demo mode.

The monitor includes a demonstration mode to be used for training and sales activities. Installed parameters are simulated when the demo mode is turned on. All of the functions of the monitor will be simulated in the demo mode, including alarms, trends, and NIBP history.

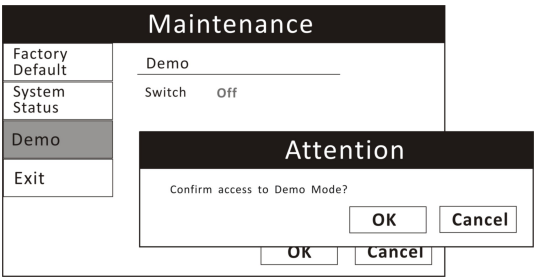

Figure 13.2: Demo Mode

To turn on the demo mode:

1. On the maintenance menu, highlight DEMO and push the knob to select.

2. Turn the rotary knob to highlight OFF and push the knob to select.

3. Turn the knob to ON and push to select.

4. Turn the rotary knob to highlight YES and push the knob to select. An attention will pop up to remind if you are ready to the demo mode. Turn the rotary knob to highlight OK and push to select.

DEMO will be displayed, gray, in the middle of the display.

To turn off the demo mode:

1. On the maintenance menu, highlight DEMO and push the knob to select.

2. Turn the rotary knob to highlight ON and push the knob to select.

3. Turn the rotary knob to OFF and push to select.

4. Press the OK button to turn the demo mode off.

The monitor will return to normal operating conditions and will collect patient data.

Chapter 14: Optional Supplies and Accessories

CAT. NO.	DISCRIPTION	QTY
9234	Manual, Operation	Each
6535	Power Cord, 220V	Each
2369	Cable, ECG, 5-lead	Each
4224	Oximetry Sensor, Clip, Any Patient	Each
4235	SpO2 Extension Cable	Each
7360	NIBP Cuff, Extra Small, 3-6cm	Each
7361	NIBP Cuff, Small, 4-8cm	Each
7362	NIBP Cuff, Medium, 6-11cm	Each
7363	NIBP Cuff, Large, 17-4cm	Each
3967	Surface Temperature Probe	Each
3968	Rectal Temperature Probe	Each

14.1 Ordering Information

For ordering information, contact your local distributor or the Utech Co., Ltd. customer service department at the address or phone number below:

3rd floor, NO.39, Jinqiao Road,
Zhangjiawan, Shapingba District,
Chongqing, China

Phone (+86)23-6172-8390
Fax (+86)23-6172-8391
E-mail service@chinautech.com
Web site www.chinautech.com

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Chapter 15: Specification

15.1 Display

7-inch diagonal high-resolution TFT (Thin Film Transistor) Active Matrix LCD

Resolution: 800 X 480 pixels

15.2 Indicators

LEDs: Work Status LED
AC Power LED
Battery Charge LED
Battery Supply LED
Alarm Silence LED

15.3 Alarm Volume

45dBA to 85 dBA at 1 meter distance (adjustable)

15.4 Keys/User Controls

- On/Off Key
- NIBP Key
- Freeze Key
- Alarm Silence Key
- Mode Key
- Menu Key
- Rotary Knob

15.4 ECG

Heart Rate Range:	20-350 bpm
Heart Rate Accuracy:	±2 bpm or ±2% (whichever is greater)
QRS Detection Range:	0.5 to 5 mV
Pace Pulse Detection:	±2 mV to ±700 mV amplitude
Detection Duration:	0.1 - 2.0 ms
Alarm Ranges Heart Rate:	High: 20-350 bpm and OFF Low: 20-350 bpm and OFF
Heart Rate Averaging:	Fixed 8 second averaging
Lead Selection:	I, II, III, V, aVR, aVL, or aVF (5-lead)
Display Gain Settings:	X 1/4, X1/2, X1, X2, X4
Input Range:	-5.0 mV to +5.0 mV
Frequency Response:	0.05 Hz to 40 Hz
Input Impedance:	>5 Mohms differential, as required and tested per ANSI/AAMI EC-13.
I-Leakage:	< 10 uA
Patient Isolation:	> 4000 VAC
Display Waveform:	120 Hz; 6.25, 12.5, 25, or 50 mm/sec
Update Rate Digits:	1 Hz

15.5 SpO_2

SpO_2 Range:	0-100% Functional Saturation
SpO_2 Accuracy:	± 2% @ 70-100% <70% unspecified
Pulse Rate Range:	20-350 bpm
Pulse Rate Accuracy:	± 2 bpm or ± 2% (whichever is greater)
SpO_2 Alarm Ranges:	
High:	50-100% and OFF
Low:	50-100% and OFF
Calibration:	Factory calibrated over range 50% to 100% SpO_2 using human blood samples to functional saturation.

15.6 NIBP

Blood Pressure Measuring

Method of Measurement:	Oscillometric with step-down deflation
Range: Systolic:	40 to 270 mmHg
Mean Arterial:	30 to 220 mmHg
Diastolic:	20 to 200 mmHg
Pulse:	25 to 300 bpm
NIBP Accuracy:	Algorithm based on human algorithm that meets or exceeds accuracy requirements of ANSI / AAMI SP10:1992 and 2002 standards for non-invasive blood pressure using the oscillometric method.

Inflation Pressure Settings

Measurement Time:	30 to 50 seconds typical, 120 seconds maximum
Default Inflation Pressure:	200 mmHg - Cat 150 mmHg - Dog 120 mmHg - Horse
Calibration:	Factory calibrated
AUTO Interval Times:	2, 3, 5, 10, or 30 minutes, or 1, 2 hours
Alarm Range:	20-260 (in 1 mmHg steps), and OFF
Pulse Rate Accuracy:	25- 250 bpm, ± 2% or ± 3 bpm (whichever is greater) 251-300 bpm, ± 5%

15.7 Respiration Rate (RESP)

Range:	0-120 breaths per minute (rpm)
Accuracy:	±1 rpm
Resolution:	1 rpm
RESP Alarm Range:	
High:	0-120 rpm (1 rpm steps), and OFF
Low:	0-120 rpm (1 rpm steps), and OFF

15.8 Temperature (TEMP)

Channel:	Two
Range:	25-45^{0}C
Accuracy:	± 0.2^{0}C plus the temperature sensor tolerance
Resolution:	0.1 ^{0}C
TEMP Alarm Range:	
High:	35.5-43.5 ^{0}C and OFF in 0.1 Increments
Low:	35.5-43.5 ^{0}C and OFF in 0.1 Increments

15.9 Default Alarms Limits

Parameter (unit)		Default values of high alarm limit			Default values of low alarm limit		
		Cat	Dog	Horse	Cat	Dog	Horse
HR（bpm）		200	160	150	90	70	45
NIBP (mmHg)	SYS	200	180	150	90	70	40
	DIA	105	90	60	40	35	20
	MAP	150	125	70	50	45	20
SpO2 (%)		99	99	97	85	85	85
RR		80	40	35	25	15	5
TEMP ^{0}C		37.6	38.1	38.1	36.1	36.1	36.1
Ⅰ（mV）		0.23	0.22	0.20	-0.23	-0.22	-0.20
Ⅱ（mV）		0.20	0.20	0.20	-0.20	-0.20	-0.20
Ⅲ（mV）		0.20	0.20	0.20	-0.20	-0.20	-0.20
aVR（mV）		0.23	0.22	0.20	-0.23	-0.22	-0.20
aVL（mV）		0.20	0.20	0.20	-0.20	-0.20	-0.20
aVF（mV）		0.20	0.20	0.20	-0.20	-0.20	-0.20
V（mV）		0.20	0.20	0.20	-0.20	-0.20	-0.20

15.10 Power Requirement

AC Input: 100 to 240V, 50/60 Hz

15.11 Dimensions

Width:	300mm (11.81 inches)
Length:	180mm (7.09 inches)
Height:	129mm (5.08 inches)
Weight:	2.05 kg (4.52lbs)

15.12 Environmental

Temperature:	0 to 50 ^{0}C（Operating)
	-40 to 75 ^{0}C (Storage)
Humidity:	15 to 95% (Operation)
	10 to 95% (Storage)

15.13 Equipment Classification

Type of Protection: (Against Electric shock)	Class 1 &Internally Powered
Mode of operation:	Continuous
Degree of Protection: (Against ingress of Liquids)	IPX1, drip proof
Degree of Mobility:	Portable
Degree of Protection: (Against Electric Shock)	Type CF
Safety Requirements:	EN60601-1:2002

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